Available online at www.sciencedirect.com
ScienceDirect
ELSEVIER Journal of Economic Dynamics & Control 30 (2006) 2447–2467
JOURNAL OF Economic Dynamics & Control
www.elsevier.com/locate/jedc

The incidence and persistence of corruption in economic development

Keith Blackburn[a], Niloy Bose[b,*], M. Emranul Haque[a]

[a]*Centre for Growth and Business Cycles Research, Economic Studies, University of Manchester*
[b]*Department of Economics, University of Wisconsin (Milwaukee), Bolton Hall #864, Milwaukee, WI 53201-0413, USA*

Received 9 June 2004; accepted 27 July 2005
Available online 3 November 2005

Abstract

Economic development and bureaucratic corruption are determined jointly in a dynamic general equilibrium model of growth, bribery and tax evasion. Corruption arises from the incentives of public and private agents to conspire in the concealment of information from the government. These incentives depend on aggregate economic activity which, in turn, depends on the incidence of corruption. The model produces multiple development regimes, transition between which may or may not occur. In accordance with recent empirical evidence, the relationship between corruption and development is predicted to be negative.

JEL classification: D73; H26; O11

Keywords: Corruption; Bribery; Tax evasion; Development

1. Introduction

Public sector corruption is pervasive throughout the world. In one form or another, and to a lesser or greater degree, it exists in all societies, at all stages of development and under all types of politico-economic regime. Over the past few

*Corresponding author. Tel.: +1 414 229 6132; fax: +1 414 229 3860.
E-mail address: nbose@uwm.edu (N. Bose).

0165-1889/$ - see front matter
doi:10.1016/j.jedc.2005.07.007

years, the fight against corruption, particularly in developing countries, has become high on the agenda of various international organisations, such as the World Bank and IMF (e.g., Jain, 2001; Rose-Ackerman, 1997). This has been motivated by a deepening belief that good quality governance is essential for sustained economic development. Recent innovations at the empirical level have allowed this belief to be tested, and there is now a large body of evidence to support it. By contrast, there remains relatively little by way of formal theoretical analysis that would lend rigour and precision to the arguments involved. Our objective in this paper is to provide such an analysis.[1]

A broad definition of public sector corruption is the abuse of authority by bureaucratic officials who exploit their powers of discretion, delegated to them by the government, to further their own interests by engaging in illegal, or unauthorised, rent-seeking activities. To many observers, corruption in public office is an inevitable aspect of state intervention which typically entails some transfer of responsibility from the government to a bureaucracy in a principal-agent type relationship. A considerable amount of research, in both economics and political science, has been devoted towards understanding the micro-foundations of this relationship and the implications for efficiency and welfare (e.g., Banerjee, 1997; Carillo, 2000; Klitgaard, 1988, 1990, 1991; Mookherjee and Png, 1995; Rose-Ackerman, 1975, 1978, 1999; Shleifer and Vishny, 1993). Much less research has been directed towards analysing the joint determination of corruption, growth and development within the context of fully specified dynamic general equilibrium models.

At the empirical level, it is only since the early 1980s that reliable data on corruption has become widely available. Prior to that time, researchers were forced to rely largely on anecdotal evidence obtained from country-specific case studies. This made it difficult to evaluate alternative views about the effects of bureaucratic malfeasance. A seemingly plausible view was that corruption could actually be growth-enhancing by helping to circumvent cumbersome regulations (red tape) in the bureaucratic process: that is, bribes may act as 'speed money' which bureaucrats accept in return for overcoming institutional rigidities that work against efficiency (e.g., Huntington, 1968; Leff, 1964; Leys, 1970; Lui, 1985). As well as being questionable on conceptual grounds (e.g., Bardhan, 1997), this view may be challenged on the basis of more recent, more systematic, and more persuasive empirical evidence. This evidence has been obtained using cross-country corruption data compiled since the early 1980s from questionnaire surveys by a number of international organisations (most notably, Business International Corporation, Political Risk Services Incorporated and Transparency International). While differing in their precise construction, these corruption indices – which rank countries according to the extent to which corruption is perceived to exist – are very closely correlated with each other, lending weight to the argument that they provide

[1] For surveys of the existing literature, see Bardhan (1997), Jain (2001) and Rose-Ackerman (1998).

reliable estimates of the actual extent of corruption activity.[2] Their publication has given rise to a burgeoning empirical literature on the relationship between corruption, growth and other variables. The main findings of this literature, summarised below, offer little support for the 'speed money' hypothesis.

First, and foremost, there is overwhelming evidence of a significant negative relationship between the incidence of corruption and economic growth.[3] According to Mauro (1995), the principal mechanism through which corruption affects growth is a change in private investment: an improvement in the corruption index by one standard deviation is estimated to increase investment by as much as 3% of output. In the same study it is also observed that the correlation between growth and corruption remains consistently negative in sub-samples of countries where bureaucratic regulations are reported to be particularly cumbersome (a result which contradicts the notion that corruption provides a way of by-passing such regulations). Likewise, Ades and Di Tella (1997) find little evidence of any beneficial effects of corruption in countries mired with red tape, while Kauffman and Wei (2000) conclude that the use of bribes to speed up individual transactions with bureaucrats is largely self-defeating as the number of transactions tends to increase. Further confirmation that corruption impedes, rather than fosters, growth is provided in many other empirical analyses (e.g., Gyimah-Brempong, 2002; Keefer and Knack, 1997; Knack and Keefer, 1995; Li et al., 2000; Sachs and Warner, 1997). From a different perspective, Mauro (1997) studies the implications of corruption for the allocation of public funds, presenting evidence which suggests that corruption distorts public expenditures away from growth-promoting areas (e.g., health and education) towards other types of project (e.g., infrastructure investment) that are less productivity-enhancing. Similar considerations occupy the attention of Tanzi and Davoodi (1997) who find evidence of bureaucratic malpractice manifesting in the diversion of public funds to where bribes are easiest to collect, implying a bias in the composition of public spending towards low-productivity projects (e.g., large-scale construction) at the expense of value-enhancing investments (e.g., maintenance or improvements in the quality of social infrastructure).

Second, there is evidence to suggest that the relationship between corruption and growth is two-way causal: bureaucratic malpractice not only influences, but is also influenced by, the level of development. In a thorough and detailed study by Treisman (2000), rich countries are generally rated as having less corruption than poor countries, with as much as 50 to 73 percent of the variations in corruption indices being explained by variations in per capita income levels. These findings, supported in numerous other investigations (e.g., Ades and Di Tella, 1999; Fisman and Gatti, 2002; Frechette, 2001; Husted, 1999; La Porta et al., 1999; Montinola and Jackman, 1999; Paldam, 2002; Rauch and Evans, 2000), indicate that cross-country

[2]For more detailed discussions, see Ades and Di Tella (1997), Jain (1998), Tanzi and Davoodi (1997) and Treisman (2000).

[3]Some early evidence of this can be found in Gould and Amaro-Reyes (1983) and United Nations (1989).

differences in the incidence of corruption owe much to cross-country differences in the level of prosperity.[4]

Third, there is also evidence to suggest that corruption and poverty may become so ingrained into the fabric of society as to establish themselves as more-or-less permanent fixtures, rather than being transient phenomena (e.g., Bardhan, 1997; Sah, 1988). A cursory inspection of the data reveals that many of the most poor and corrupt countries in the past are among the most poor and corrupt countries today.[5] This conjures up the idea of poverty traps and the notion that some countries may be drawn into a vicious circle of low growth and high corruption, from which there is no easy escape.

As indicated earlier, there exists relatively little theoretical research on the dynamic general equilibrium modelling of corruption and development.[6] Two notable exceptions are the analyses of Ehrlich and Lui (1999) and Sarte (2000) who offer different explanations for why bureaucratic malpractice may be detrimental to growth.[7] In what follows, we provide a further explanation which delves more deeply into the questions of why corruption may arise to begin with, why corruption may persist (or decline) over time and why corruption may vary widely across economies. As well as its contribution to the theoretical literature, the paper raises issues that are important for empirical work in the area.

Our analysis is based on a simple neo-classical growth model in which public agents (bureaucrats) are delegated the responsibility for collecting taxes from private individuals (households) on behalf of the political elite (the government). Bureaucrats have the opportunity to engage in corrupt practices which are difficult to monitor by the government. Specifically, bureaucrats may exploit their powers of public office to collude with households in bribery and tax evasion: a bribe to a bureaucrat holds the promise that the income of a household will be reported falsely and exempt from any tax.[8] A bureaucrat who accepts a bribe must spend resources on trying to conceal his misconduct. These costs depend positively on how much bribe income the bureaucrat appropriates and how many other bureaucrats are transgressing in the same way. The punishment for bribe-taking is that the

[4]Other factors that appear to be significant in determining corruption are the colonial heritage, religious tradition, legal system, federal structure, democratisation and openness to trade of a country.

[5]Examples include Bangladesh, Cameroon, India, Indonesia, Kenya, Nigeria, Pakistan and Uganda. According to the data from Transparency International, these belong to a set of countries that have displayed little, or no, improvement in their corruption and growth records since the early 1980s.

[6]In a purely static context, Acemoglu and Verdier (1998, 2000) conduct a general equilibrium analysis of how corruption may form part of an optimal allocation in which market failure is traded off against government failure.

[7]The former develop a model in which corruption opportunities in public office offer the prospect of economic rents that create incentives for individuals to divert resources away from growth-promoting activities (investments in human capital) towards power-seeking activities (investments in political capital). The latter presents a framework in which rent-seeking bureaucrats restrict the entry of firms into the formal sector of the economy, thereby creating a larger informal sector (where property rights are less well protected) which may result in a lower overall growth rate if the cost of informality is high.

[8]It is possible to reformulate the model as a model of pure theft, where a bureaucrat simply steals the taxes that he collects from a household, or embezzles some amount of total public funds.

bureaucrat loses everything, being fined the full amount of his legal and illegal earnings. The former is his salary which is positively related to the stock of capital in the economy. This implies that, ceteris paribus, the incentive to be corrupt is higher at lower levels of capital, or lower stages of development.[9] For any given level of capital, it is then possible to determine the precise incidence of corruption, measured either as the total number of bribe-taking bureaucrats or as the total value of bribe income. Both measures exhibit similar patterns of decline as development takes place. At the same time, the effect of corruption, itself, is to impede the development process. This occurs because of a loss of resources available for productive investments as bureaucrats engage in costly subterfuge.

Based on the above, our analysis provides an account of the joint, endogenous determination of corruption and development in a relationship that is both negative and two-way causal. This relationship is reflected in the existence of multiple development regimes associated with different incidences of corruption. Depending on parameter values and initial conditions, transition between these regimes may or may not be feasible. In the absence of transition, there are multiple long-run equilibria, including a poverty trap equilibrium in which corruption remains permanently high.

The results obtained from our analysis allow us to explain why the incidence of corruption may vary markedly among economies. More traditional explanations appeal to cross-country differences in institutions, regulations and social customs which influence bureaucrats' opportunities and incentives for engaging in corrupt practices, as well as shaping public attitudes towards these practices. Such arguments have been criticised for being almost tautological and for failing to account for real-world observations (e.g., Bardhan, 1997). Another, more contemporary, explanation is derived from microeconomic models of frequency-dependent equilibria, where the extent of corruption at the group level is a key determinant of the proclivity towards corruption at the individual level (e.g., Andvig and Moene, 1990; Cadot, 1987; Sah, 1988).[10] While grounded more firmly on economic principles, this idea has yet to be embedded in a theory of development and may be challenged for leaving too much to chance: whether or not corruption occurs depends primarily on whether or not it is expected to occur. From a practical perspective, what one would like to know is how an economy might settle in one equilibrium rather than another as a result of the interplay between the fundamental determinants of corruption and growth. According to our own analysis, the limiting outcome of an economy depends predictably on the deep parameters describing preferences and technologies, together

[9]The implied inverse relationship between the pay of bureaucrats and the incidence of corruption is consistent with the findings of several empirical studies (e.g., Ades and Di Tella, 1997; Chand and Moene, 1997; Mookherjee and Png, 1995). Based on these findings, it has been argued that corruption could be mitigated by raising bureaucrats' salaries, especially in developing countries where salaries are so low as to almost invite corruption as a means of making ends meet. This argument may be challenged on theoretical grounds (e.g., Besley and McLaren, 1993) and empirical support for it is very mixed (e.g., Rauch and Evans, 2000; Rijckeghem and Weder, 1997; Treisman, 2000).

[10]See also Tirole (1996) for an analysis of reputation effects in corruption, and Sah (1991) for an analysis of contagion effects in crime.

with initial conditions. Cross-country differences in the incidence of corruption can occur because of cross-country differences in any of these features. In particular, the extent of corruption may vary even among countries that are identical in every respect, except for their initial circumstances. An economy that is poor and corrupt to begin with may be destined to remain poor and corrupt unless there is a radical change in events. Based on these results, we view our analysis as a promising step towards understanding the persistent differences in income and corruption levels around the world.

The paper is organised as follows. In Section 2 we describe the economic environment in which agents make decisions. In Section 3 we study the incentives of agents to engage in corruption. In Section 4 we analyse the dynamic general equilibrium interaction between corruption and development. In Section 5 we offer some concluding remarks.

2. The environment

Time is discrete and indexed by $t = 0, \ldots, \infty$. There is a constant population of two-period-lived agents belonging to overlapping generations of dynastic families. Agents of each generation are divided into two groups of citizens – private individuals (or households), of whom there is a fixed measure of mass m, and public servants (or bureaucrats), of whom there is a fixed measure of mass $n<m$.[11] Households are differentiated according to differences in their labour endowments which determine their relative incomes and their relative propensities to be taxed. Specifically, we assume that a fraction, $\mu \in (0,1)$, of households are endowed with $\lambda > 1$ units of labour and are liable to pay tax, while the remaining fraction, $1-\mu$, are endowed with only one unit of labour and are exempt from paying tax. Taxes are collected by bureaucrats on behalf of the government which requires funding for public expenditures. For simplicity, we assume that bureaucrats are exempt from paying taxes. Each bureaucrat has one unit of labour endowment and is responsible for collecting taxes from $(\mu m/n)$ households. Corruption arises from the incentive of a bureaucrat to conspire with a household in concealing information (the household's income) from the government. In doing this, the bureaucrat expects to gain from his acceptance of a bribe and the household expects to gain from its evasion of tax. We assume that a fraction, $\eta \in (0,1)$, of bureaucrats are corruptible in this way, while the remaining fraction, $1-\eta$, are non-corruptible, with the identity

[11] We assume that agents are differentiated at birth according to their abilities and skills. A population of m agents lack the skills necessary to become bureaucrats, while a population of n agents possess these skills. The latter are induced to become bureaucrats by an allocation of talent condition established below. Thus, as in other analyses (e.g., Barreto, 2000; Ehrlich and Lui, 1999; Sarte, 2000), we abstract from issues relating to occupational choice. In doing so we are able to simplify the analysis by not having to consider possible changes in the size of the bureaucracy and possible changes in the level of corruption that may result from this.

of each bureaucrat being unobservable by the government.[12] Agents are risk neutral, working only when young and consuming only when old.[13] Production of output is undertaken by firms, of which there is a continuum of unit mass. Firms hire labour from households and rent capital from all agents. All markets are perfectly competitive.[14]

2.1. The government

We envisage the government as providing public services which contribute to the efficiency of output production (e.g., Barro, 1990). Expenditure on these services, g_t, is assumed to be a fixed proportion, $\theta \in (0, 1)$, of output. The government also incurs expenditures on bureaucrats' salaries which are determined as follows. Any bureaucrat (whether corruptible or non-corruptible) can work for a firm to receive a non-taxable income equal to the wage paid to households. Any bureaucrat who is willing to accept a salary less than this wage must be expecting to receive compensation through bribery and is therefore immediately identified as being corrupt. As in other analyses (e.g., Acemoglu and Verdier, 1998), we assume that a bureaucrat who is discovered to be corrupt is subject to the maximum fine of having all of his income confiscated (i.e., he is dismissed without pay). Given this, then no corruptible bureaucrat would ever reveal himself in the way described above. As such, the government can minimise its labour costs, while ensuring complete bureaucratic participation, by setting the salaries of all bureaucrats equal to the wage paid by firms to households.[15]

The government finances its expenditures each period by running a continuously balanced budget. Its revenues consist of the taxes collected by bureaucrats from high-income households, plus any fines imposed on bureaucrats who are caught engaging in corruption. We denote by τ_t the lump-sum tax levied on each high-income household. Since the government knows how much tax revenue is due in the

[12] This assumption may be thought of as capturing differences in the propensities of bureaucrats to engage in corruption, whether due to differences in proficiencies at being corrupt or differences in moral attitudes towards being corrupt (e.g., Acemoglu and Verdier, 2000; Besley and McLaren, 1993; Tirole, 1996). The main purpose of the assumption is to allow us to determine the wages of bureaucrats in a relatively straightforward way that does not demand additional assumptions about how public sector pay is determined. In fact, all we need for this purpose is that there be at least one bureaucrat who is non-corruptible – all other bureaucrats may well be potential transgressors.

[13] The assumption that all first period income is saved is made for convenience. The model could be extended to allow for endogenous savings decisions without altering our main results or yielding additional insights.

[14] An interesting issue – one that lies beyond the scope of our analysis – is the extent to which market structure might influence the incidence of corruption. In Bliss and Di Tella (1997), for example, it is shown how greater competition may do little to reduce, and may even foster, corrupt practices. From a development perspective, this may be allied to the observation that, at least in the first instance, transition from a controlled to a more market-oriented economy appears often to be associated with an increase in corruption (e.g., Bardhan, 1997; Basu and Li, 1998).

[15] This has the usual interpretation of an allocation of talent condition. The government cannot force any of the n potential bureaucrats to actually take up public office, but it is able to induce all of them to do so by paying what they would earn elsewhere.

absence of corruption (since it knows the number of taxable households and since it is responsible for setting taxes), any shortfall of revenue below this amount reveals that corruption is occurring. Under such circumstances, the government investigates the behaviour of bureaucrats using an imprecise monitoring technology. This technology implies that a bureaucrat who is corrupt faces a probability, $p \in (0,1)$, of avoiding detection, and a probability, $1-p$, of being found out. The tax-evading household with whom the bureaucrat conspires faces the same probabilities of remaining anonymous and being exposed. In the event that corruption is detected, the bureaucrat is fined the full amount of his legal and illegal income, while the household is forced to pay its full tax liability.[16]

2.2. Households

Each young household of generation t receives an income of z_t^h which it saves at the market rate of interest r_{t+1} to obtain a final level of wealth of $(1+r_{t+1})z_t^h$ when it reaches old-age. A household consumes part of this wealth and bequeaths the remainder to its offspring. Its lifetime utility is given as $u_t^h = (1+r_{t+1})z_t^h - q_{t+1} + v(q_{t+1})$, where $(1+r_{t+1})z_t^h - q_{t+1}$ is consumption, q_{t+1} is the bequest and $v(\cdot)$ is a strictly concave function that satisfies the usual Inada conditions.[17] It follows that utility is maximised by setting $v'(\cdot) = 1$, implying an optimal fixed size of bequest from one generation to the next: that is, $q_{t+1} = q$ for all t. As we shall see, the rate of interest, r_{t+1}, is also constant in equilibrium. Given this, then the expected utility of a household is fully determined once its expected income, or saving, is determined.

Each household, when young, is paid a wage, w_t, from supplying inelastically its labour endowment to a firm. A household endowed with one unit of labour earns a total labour income of w_t and is exempt from paying taxes. Obviously, such a household has no incentive to engage in tax evasion and its (expected) saving is simply $w_t + q$. A household endowed with λ units of labour earns a total labour income of λw_t and is obliged pay taxes of τ_t. This type of household may or may not conspire with a bureaucrat in bribery and tax evasion. If not, then its saving is $\lambda w_t + q - \tau_t$. If so, then its saving is uncertain and depends on the amount of bribe paid and the chances of being caught. Let x_t denote the bribe. With probability p, the household and bureaucrat succeed in their conspiracy and the household earns

[16]We assume, for simplicity, that monitoring is costless. Suppose, instead, that the government incurs d units of expenditure on detecting corruption. Then p, the probability of a bureaucrat evading detection, might reasonably be thought of as being a decreasing function of d which, in turn, might be thought of as being chosen optimally by the government according to some criteria (e.g., maximisation of its revenues). This would have the characteristics of a costly state verification problem, where the government would announce ex ante its optimal d (and therefore p) that would generally depend on a number of factors (such as taxes, wages and the level of corruption). Needless to say, this would complicate our analysis and raise additional issues relating to corner solutions and government objectives. Since the inclusion of costly monitoring is surplus to our requirements, we prefer to ignore it and keep the analysis more tightly focused on matters of greater interest to us.

[17]This function captures the 'warm-glow', or 'joy-of-giving' motive for making bequests. We choose this simple way of modelling altruism since the main role of bequests in our model is merely to ensure the existence of a well-defined steady state equilibrium.

$\lambda w_t + q - x_t$. With probability $1 - p$, their collusion is exposed and the household is forced to pay its full tax liability, implying earnings of $\lambda w_t + q - \tau_t - x_t$.[18] Given these outcomes, we may write the expected income of each high-income household as

$$\mathrm{E}(z_t^h|x_t) = \begin{cases} \lambda w_t + q - \tau_t & \text{if } x_t = 0, \\ \lambda w_t + q - (1-p)\tau_t - x_t & \text{if } x_t > 0. \end{cases} \tag{1}$$

2.3. Bureaucrats

Each young bureaucrat of generation t receives an income of z_t^b which he saves at the interest rate r_{t+1} to acquire a final wealth of $(1 + r_{t+1})z_t^b$ during retirement. For simplicity, we assume that a bureaucrat consumes all of this wealth (i.e., is non-altruistic), deriving lifetime utility of $u_t^b = (1 + r_{t+1})z_t^b$. As above, since r_{t+1} is fixed in equilibrium, a bureaucrat's expected utility is fully determined once his expected income, or saving, is determined.

Each bureaucrat, when young, is paid the salary w_t from supplying inelastically his unit labour endowment to the government. By definition, a bureaucrat who is non-corruptible is never corrupt and will never participate in bribery and tax evasion. The income of such a bureaucrat is simply w_t. In contrast, a bureaucrat who is corruptible may or may not be corrupt, and may or may not engage in rent seeking. Let $\varepsilon_t \in (0, 1)$ denote the fraction of such bureaucrats who are actually corrupt, $1 - \varepsilon_t$ being the remaining fraction who are not corrupt. For each of the latter, income is w_t, as before. For each of the former, income is uncertain and depends on the amount of bribes received, the chances of being caught, the resources spent on trying to avoid detection and the penalties incurred if exposed. In general, corrupt individuals may try to remain inconspicuous by hiding their illegal income, by investing this income differently from legal income and by altering their patterns of expenditure.[19] These activities typically entail costs in one form or another. For the purposes of the present analysis, we make the simple assumption that a bureaucrat who is corrupt needs to spend resources, C_t, on trying to conceal his behaviour if he is to stand any chance of not being caught. It is plausible to imagine that more resources must be spent the greater is the amount of illegal income that a bureaucrat appropriates and the greater also is the number of other bureaucrats who are behaving in the same way. The presumption in both cases is that corruption would be more visible and less easy to conceal, implying extra costs for a bureaucrat in trying to avoid detection.[20] We model these features by specifying C_t to be an

[18]Throughout our analysis, we assume appropriate restrictions on parameter values to ensure positive net incomes for all high-income household.

[19]It may even be the case that income from corruption at one level is used to foster corruption at other levels (e.g., to ensure non-interference from the legal authorities). Discussions of these issues can be found in Rose-Ackerman (1996) and Wade (1985), among others.

[20]For example, it is presumably more difficult for individuals to dispose of large, rather than small, amounts of illegal income without this income being traced by the government. Similarly, one may imagine

increasing function of both the total bribe income of a bureaucrat, $(\mu m/n)x_t$, and the total population of bureaucrats who accept bribes, $\varepsilon_t\eta n$. A convenient formulation of this cost function is

$$C_t = \left[\left(\frac{\mu m}{n}\right)x_t\right]^\beta (1+\varepsilon_t\eta n)^\gamma \tag{2}$$

($\beta>1$, $\gamma>0$). With probability p, a bribe-taking bureaucrat succeeds in his deception and saves the amount $w_t + (\mu m/n)x_t - C_t$. With probability $1-p$, the bureaucrat is apprehended and left with nothing. Accordingly, we may write the expected income of each corruptible bureaucrat as

$$\mathrm{E}(z_t^b|x_t) = \begin{cases} w_t & \text{if } x_t = 0, \\ p\left[w_t + \left(\frac{\mu m}{n}\right)x_t - C_t\right] & \text{if } x_t > 0. \end{cases} \tag{3}$$

2.4. Firms

The representative firm produces output, y_t, according to the following technology:

$$y_t = Al_t^\alpha k_t^{1-\alpha} g_t^\alpha, \tag{4}$$

($A>0$, $\alpha \in (0,1)$) where l_t denotes labour and k_t denotes capital.[21] The firm hires labour at the competitively determined wage rate w_t and rents capital at the competitively determined rental rate r_t. Profit maximisation implies $w_t = \alpha A l_t^{\alpha-1} k_t^{1-\alpha} g_t^\alpha$ and $r_t = (1-\alpha)Al_t^\alpha k_t^{-\alpha} g_t^\alpha$. Since $l_t = l = (\lambda\mu + 1 - \mu)m$ in equilibrium, and since $g_t = \theta y_t$ by assumption, we may write these conditions as

$$w_t = \left(\frac{a\alpha}{l}\right)k_t, \tag{5}$$

$$r_t = r = a(1-\alpha), \tag{6}$$

where $a = [A(l\theta)^\alpha]^{1/(1-\alpha)}$. Thus the equilibrium wage is proportional to the capital stock, while the equilibrium interest rate is constant.

3. The incentive to be corrupt

Corruption occurs if a high-income household and a corruptible bureaucrat find it mutually advantageous (or non-disadvantageous) to conspire with each other in

(*footnote continued*)
that the more corrupt people there are, the more difficult it will be for each one of them to launder his ill-gotten gains in ways that the government does not know about. For the purposes at hand, one may wish to fix ideas by thinking simply of each bureaucrat as having access to some costly laundering technology, where the cost increases with the amount of illegal funds that both he and others are trying to conceal.

[21] This is essentially the production technology used by Barro (1990), where public services, g_t, enter as labour-augmenting inputs which create externality effects and produce constant returns to the accumulable factors of production.

concealing information from the government. Under such circumstances, there is bribery and tax evasion. In what follows we study the individual incentives of private and public agents to behave in this way.[22]

For a corruptible bureaucrat, the expected return from accepting a bribe is given in (3) as $E(z_t^b|x_t>0)$, where C_t is determined according to (2). The size of bribe that maximises this payoff is established as

$$\left(\frac{\mu m}{n}\right)x_t = \beta^{1/(1-\beta)}(1+\varepsilon_t\eta n)^{\gamma/(1-\beta)}. \tag{7}$$

Thus, each bureaucrat finds it optimal to demand a smaller size of bribe the greater is the number of other bribe-taking bureaucrats because the higher are the costs of concealing bribe income. A bureaucrat's return from not accepting a bribe is also given in (3) as $E(z_t^b|x_t=0)$. The bureaucrat has an incentive to be corrupt if $E(z_t^b|x_t>0)\geqslant E(z_t^b|x_t=0)$, or $p[(\mu m/n)x_t - C_t]\geqslant(1-p)w_t$. For the case in which bribes are chosen optimally (i.e., in accordance with (7)), this incentive condition is given by

$$p(\beta-1)B(1+\varepsilon_t\eta n)^{\gamma/(1-\beta)}\geqslant(1-p)w_t, \tag{8}$$

where $B=\beta^{\beta/(1-\beta)}$. Intuitively, a bureaucrat is more likely to be corrupt the less he expects to lose in legal income if he is caught and the more he expects to gain in illegal income if he is not caught.

For a high-income household, the expected returns from paying and not paying a bribe are given in (1) as $E(z_t^h|x_t>0)$ and $E(z_t^h|x_t=0)$, respectively. The household has an incentive to offer a bribe if $E(z_t^h|x_t>0)\geqslant E(z_t^h|x_t=0)$. This condition may be written as

$$x_t\leqslant p\tau_t. \tag{9}$$

Intuitively, a household is prepared to bribe a bureaucrat by no more than what it expects to save in taxes.

Observe that, if (9) is satisfied for x_t in (7), then the household is willing to pay the bureaucrat his optimal bribe. For the purposes of simplifying our subsequent analysis, we assume that this is the case.[23] Under such circumstances, the condition for corruption to occur is given solely by the condition in (8), being determined exclusively by the incentives of corruptible bureaucrats. Given this, then one may deduce precisely what fraction of these bureaucrats are actually corrupt. To do so, consider an $\varepsilon_t\in(0,1)$ such that, for a given w_t, (8) is either satisfied with inequality or is not satisfied at all. Neither of these situations can be an equilibrium: in the first case some bureaucrats are choosing not to accept bribes when it pays them to do so, implying that ε_t would rise until (8) held with equality or until $\varepsilon_t=1$; in the second case some bureaucrats are choosing to accept bribes when it does not pay them to do

[22]In doing this, we recall that the expected utility of a household is $E(u_t^h)=(1+r)E(z_t^h)-q+v(q)$ and the expected utility of a bureaucrat is $E(u_t^b)=(1+r)E(z_t^b)$. It follows that, for both groups of agents, expected utility is maximised by choosing whatever action is appropriate to maximise expected income.

[23]As we shall see, both x_t and τ_t are functions of k_t. We may ensure that our assumption ($x_t<p\tau_t$) is satisfied by appropriate restrictions on parameter values and initial conditions.

so, implying that ε_t would fall until (8) held with equality or until $\varepsilon_t = 0$. Naturally, whenever (8) does hold with equality, ε_t will change with changes in w_t which, by virtue of (5), will change with changes in k_t. Accordingly, the actual number of bribe-taking bureaucrats is ultimately related to the level of development, as measured by the stock of capital. The precise form of this relationship is determined as

$$\varepsilon_t \eta n = \begin{cases} \eta n & \text{if } k_t \leqslant \left(\dfrac{1+\eta n}{\kappa}\right)^{\gamma/(1-\beta)} \equiv k_{\mathrm{L}}^c, \\ 0 & \text{if } k_t \geqslant \left(\dfrac{1}{\kappa}\right)^{\gamma/(1-\beta)} \equiv k_{\mathrm{H}}^c, \\ \kappa k_t^{\frac{1-\beta}{\gamma}} - 1 & \text{if } k_t \in (k_{\mathrm{L}}^c, k_{\mathrm{H}}^c) \end{cases} \tag{10}$$

where $\kappa = [(1-p)a\alpha/p(\beta-1)Bl]^{(1-\beta)/\gamma}$. The terms k_{L}^c and k_{H}^c define two critical (threshold) levels of capital that demarcate regions with different incidences of corruption: below the lower threshold level ($k_t < k_{\mathrm{L}}^c$) all corruptible bureaucrats are corrupt ($\varepsilon_t = 1$); above the higher threshold level ($k_t > k_{\mathrm{H}}^c$), none of these bureaucrats are corrupt ($\varepsilon_t = 0$); and in between the two thresholds ($k_t \in (k_{\mathrm{L}}^c, k_{\mathrm{H}}^c)$), some of them are corrupt while others are not ($\varepsilon_t \in (0,1)$). These results are due to the fact that higher levels of capital, associated with higher wages of all agents, imply higher penalties to bureaucrats if they are caught accepting bribes. In other words, the incentive to be corrupt is gradually eroded as k_t increases. This begins to take effect on bureaucratic behaviour when $k_t > k_{\mathrm{L}}^c$ and deters bureaucratic malfeasance completely when $k_t > k_{\mathrm{H}}^c$.[24]

Calculating the number of bribe-taking bureaucrats is one way of measuring the extent of corruption. Another, perhaps more appropriate, way is to compute the total value of bribe income. This is given in our model by $\varepsilon_t \eta n(\mu m/n)x_t$.[25] In principle this measure of corruption might display a negative or positive correlation with the level of development. This follows from the fact that ε_t and x_t move in opposite directions as k_t varies between k_{L}^c and k_{H}^c: in particular, an increase in k_t causes a decrease in ε_t (a smaller number of bribe-takers) but an increase in x_t (a larger size of bribe).[26] A sufficient condition for the former effect to dominate is $\beta > 1+\gamma$, a condition that we appeal to in our subsequent analysis. Given this, then the relationship between corruption and development is unambiguously negative, whichever measure of corruption is used.

[24]If there were no externalities in the cost of concealing bribe income ($\gamma = 0$ in (2)), then there would be only one critical level of capital, $k^c = (p(\beta-1)Bl)/((1-p)a\alpha)$. Under such circumstances, the incidence of corruption would be a binary variable, taking its maximum value for $k_t \leqslant k^c$ (when all corruptible bureaucrats are corrupt) and its minimum value for $k_t < k^c$ (when all corruptible bureaucrats are non-corrupt).

[25]This is simply the number of bribe-takers, $\varepsilon_t \eta n$, multiplied by the bribe payments that each one receives, $(\mu m/n)x_t$.

[26]The latter property follows from our earlier observation that x_t is decreasing in ε_t.

4. The development process

The foregoing analysis reveals the extent to which corruption is influenced by economic development. We now turn to study the process of development, itself. As we shall see, this process is not immune to the incidence of corrupt activity which has important effects on capital accumulation and growth. In this way, our model predicts a relationship between corruption and development that is fundamentally two-way causal. Throughout our analysis, we make use of some of our earlier results and assumptions. In particular, we recall that wages, w_t, are determined by (5), that bribe payments, x_t, are given by (7), and that the number of corrupt bureaucrats, $\varepsilon_t \eta n$, is governed by (10). Additionally, we deduce that the government spends $g_t = a\theta k_t$ on public goods provision and that a bureaucrat spends $C_t = B(1+\varepsilon_t \eta n)^{\gamma/(1-\beta)}$ on concealing bribe income.

The dynamic path of capital accumulation is obtained from the equilibrium condition that the total demand for capital is equal to the total supply of savings. To determine how corruption affects this path, it is necessary to consider how corruption affects public finances since the state of the government's balance sheet dictates the level of taxes required to maintain budget balance. As regards revenues to the government, we note the following. From each non-corruptible bureaucrat, of whom there are $(1-\eta)n$, the government receives $(\mu m/n)\tau_t$ in tax income. Likewise, each non-corrupt corruptible bureaucrat, of whom there are $(1-\varepsilon_t)\eta n$, returns $(\mu m/n)\tau_t$ in tax receipts as well. The population of corrupt corruptible bureaucrats, $\varepsilon_t \eta n$, is divided into a fraction, p, who evade detection and a remaining fraction, $1-p$, who are caught: from each of the former, tax returns are zero; from each of the latter, the government obtains $(\mu m/n)\tau_t$ in tax revenue and $w_t + (\mu m/n)x_t - C_t$ in fines. On the expenditure side, the government makes outlays of g_t on public goods provision and of nw_t on bureaucrats' salaries. Given these observations, we may derive the value of τ_t that satisfies the government's budget constraint. This is given by

$$\begin{aligned}(1-p\varepsilon_t\eta)\mu m\tau_t &= g_t + [1-(1-p)\varepsilon_t\eta]nw_t - (1-p)\varepsilon_t\eta n\left[\left(\frac{\mu m}{n}\right)x_t - C_t\right] \\ &= g_t + [1-(1-p)\varepsilon_t\eta]nw_t \\ &\quad - (1-p)\varepsilon_t\eta n(\beta-1)B(1+\varepsilon_t\eta n)^{\gamma/(1-\beta)}. \qquad (11)\end{aligned}$$

The effect of corruption on public finances is revealed in (11) by allowing ε_t to vary exogenously. The effect is most readily observed by comparing the two limiting cases in which corruption is at its maximum and minimum levels. It is straightforward to show that, for any given g_t and w_t (or any given k_t, on which both variables depend), τ_t is higher when $\varepsilon_t = 1$ than when $\varepsilon_t = 0$.[27] This follows from the fact that corruption entails a loss of revenue to the government from tax evasion. In spite of the extra revenue from fines, taxes must be raised in order for the government to balance its budget. Extending this result, it is possible to establish that, ceteris

[27] This result is established by making use of the conditions in (8) and (9).

paribus, an increase in ε_t leads to an increase in τ_t so that, in general, higher incidences of corruption are associated with higher levels of taxes in an otherwise unchanged environment.[28]

Given the above, we may compute the total value of savings in the economy as follows. Consider, first, the savings of households. There is a population of $(1-\mu)m$ low-income households, each of which saves the amount $w_t + q$. There is a population of $(1-\varepsilon_t\eta)\mu m$ high-income households that do not pay bribes, each of which saves $\lambda w_t + q - \tau_t$. Of the population of high-income households that do pay bribes, there is a mass of $p\varepsilon_t\eta\mu m$ that succeed in evading taxes and a remaining mass of $(1-p)\varepsilon_t\eta\mu m$ that fail in this endeavour: each of the former saves $\lambda w_t + q - x_t$, while each of the latter saves $\lambda w_t + q - \tau_t - x_t$. As regards the savings of bureaucrats, we note the following. Each non-corruptible bureaucrat, of whom there are $(1-\eta)n$, saves w_t. Each non-corrupt corruptible bureaucrat, of whom there are $(1-\varepsilon_t)\eta n$, saves w_t as well. Among the population of corrupt corruptible bureaucrats, there is a mass of $p\varepsilon_t\eta n$ who evade detection and a remaining mass of $(1-p)\varepsilon_t\eta n$ who are apprehended: each of the former saves $w_t + (\mu m/n)x_t - C_t$, while each of latter saves nothing. Collecting these terms together, we deduce the process governing capital accumulation as

$$\begin{aligned} k_{t+1} &= lw_t - g_t + mq - \varepsilon_t\eta n C_t \\ &= a(\alpha-\theta)k_t + mq - \varepsilon_t\eta n B(1+\varepsilon_t\eta n)^{\gamma/(1-\beta)}. \end{aligned} \tag{12}$$

In what follows we assume that $a(\alpha-\theta)\in(0,1)$ and $mq - \eta n B(1+\eta n)^{\gamma/(1-\beta)} > 0$ so as to ensure the feasibility of steady state equilibria.[29]

To see how corruption impacts on development, we allow ε_t to vary exogenously in (12). As before, the effect is most readily established by comparing the two polar cases in which corruption is at its maximum and minimum levels. It is evident that, for any given w_t and g_t (or any given k_t), k_{t+1} is lower when $\varepsilon_t = 1$ than when $\varepsilon_t = 0$. This is because corruption entails a loss of resources available for productive investment as a result of the costly concealment of bribe income by bureaucrats. More generally, one finds that, ceteris paribus, an increase in ε_t leads to a decrease in k_{t+1}, implying that higher incidences of corruption are associated with lower levels of development.

Taken together, the results in (10) and (12) imply a two-way causal relationship between corruption and development: the extent to which rent-seeking takes place both influences and is influenced by the level of capital accumulation. The full implications of this are revealed by consolidating the results into a single expression that characterises completely the development process. This is given by

[28] One way of thinking about this result is to consider two economies that are identical in every respect except for their levels of corruption (e.g., because of differences in the costs of concealing corruption). The result implies that taxes would be higher in the economy that is more corrupt.

[29] Evidently, the first condition requires that $\alpha > \theta$. Since α (θ) is the share of labour (government expenditure) in national income, this restriction is satisfied empirically.

the transition equation

$$k_{t+1} = F(k_t)$$
$$\equiv \begin{cases} a(\alpha-\theta)k_t + mq - \eta nB(1+\eta n)^{\gamma/(1-\beta)} & \text{if } k_t \leqslant k^c_{\mathrm{L}}, \\ a(\alpha-\theta)k_t + mq & \text{if } k_t \geqslant k^c_{\mathrm{H}}, \\ a(\alpha-\theta)k_t + mq - \kappa^{\gamma/(1-\beta)}B(\kappa k_t^{(1-\beta)/\gamma} - 1)k_t & \text{if } k_t \in (k^c_{\mathrm{L}}, k^c_{\mathrm{H}}). \end{cases} \quad (13)$$

Based on the above, we are led to distinguish between three types of development regime for the economy: the first – where $k_t \leqslant k^c_{\mathrm{L}}$ – is a low development regime in which the incidence of corruption is at its maximum level, $\varepsilon_t = 1$; the second – where $k_t \geqslant k^c_{\mathrm{H}}$ – is a high development regime in which the incidence of corruption is at its minimum level, $\varepsilon_t = 0$; and the third – where $k_t \in (k^c_{\mathrm{L}}, k^c_{\mathrm{H}})$ – is an intermediate development regime in which the incidence of corruption lies somewhere between its maximum and minimum levels, $\varepsilon_t \in (0,1)$. These regimes are shown in Fig. 1 which depicts the typical shape of the transition function, $F(\cdot)$. A steady state equilibrium is defined by a stationary point of this function such that $k^* = F(k^*)$. The equilibrium is stable if $F'(k^*) < 1$, and unstable if $F'(k^*) > 1$. There are three candidate equilibria that are stable, upto two of which may exist simultaneously: one of these – associated with $\varepsilon_t = 1$ – is a low equilibrium in which the steady state level of capital is $k^*_{\mathrm{L}} = \frac{mq - \eta nB(1+\eta n)^{\gamma/(1-\beta)}}{1 - a(\alpha-\theta)} < k^c_{\mathrm{L}}$; another – associated with $\varepsilon_t = 0$ – is a high equilibrium in which the steady state level of capital is $k^*_{\mathrm{H}} = mq/(1 - a(\alpha-\theta)) > k^c_{\mathrm{H}}$; and the remaining one – associated with $\varepsilon_t \in (0,1)$ – is an intermediate equilibrium in which the steady state level of capital satisfies $k^*_{\mathrm{M}} \in (k^c_{\mathrm{L}}, k^c_{\mathrm{H}})$. If an unstable equilibrium exists, then it does so for the case of $\varepsilon_t \in (0,1)$ and occurs at the point $k^*_{\mathrm{U}} \in (k^c_{\mathrm{L}}, k^c_{\mathrm{H}})$.

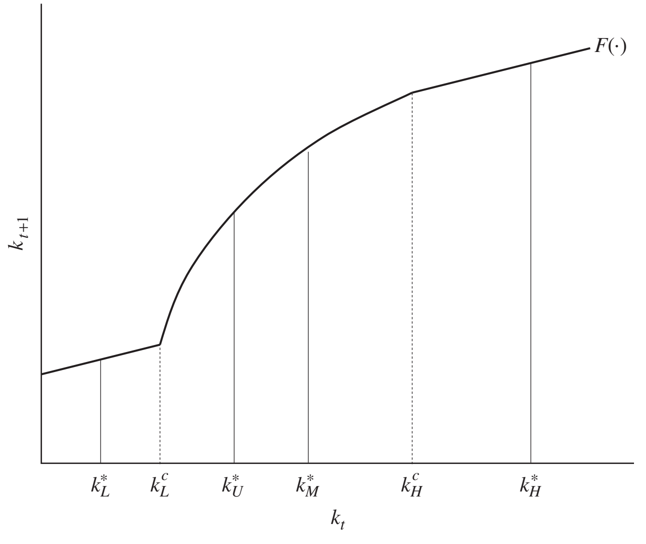

Fig. 1.

The overall evolution of the economy depends on the feasibility of transition between development regimes. The complete process of transition may be divided into two distinct stages – from the low development regime to the intermediate development regime, and from the intermediate development regime to the high development regime. Depending on circumstances, either of these stages may or may not be accomplished so that the economy may end up in any one of the regimes, including the regime where it started. For example, if the economy is poor and corrupt to begin with, then its final destination may be a steady state in which it is still poor and corrupt, or a steady state in which poverty and corruption have been partially alleviated, or a steady state in which there is prosperity without any corruption. The first and third of these possibilities are illustrated in Fig. 2. Panel A depicts the latter, where there is a single stable steady state equilibrium at k^*_{H}. Starting from any initial capital stock, k_0, the economy undergoes complete transition towards this steady state with the incidence of corruption declining continuously as it does so. Panel B depicts the former scenario, where there are two stable steady state equilibria at k^*_{L} and k^*_{H}, together with an unstable steady state at k^*_{U}. In this case an economy that starts off at any $k_0 < k^*_{\mathrm{U}}$ is irrevocably destined to end up at k^*_{L}, being mired forever with widespread corruption. To the extent that the high steady state equilibrium, k^*_{H}, would be attained if $k_0 > k^*_{\mathrm{U}}$, the model now presents a situation in which limiting outcomes depend fundamentally on initial conditions.[30]

5. Discussion and conclusions

Corruption can occur on various scales, in many shapes and forms, and at all levels within public office. Corruption can affect the allocation of resources, the process of growth and the distribution of income in an economy. These observations are not new, but they have only recently become the subject of systematic, formal investigation using modern techniques of theoretical and empirical analysis. As a result of this, economists are gaining a much better understanding of the causes and consequences, incidence and importance, of corrupt behaviour within society's public institutions.

This paper has focused on corruption among public bureaucrats and the implications of this for economic development. Our analysis incorporates the essential features that government intervention requires public officials to gather information and administer policies, and that at least some of these officials are corruptible in the sense of being willing to misrepresent information at the right

[30]Similar results are obtained when the costs of concealing bribe income are independent of external effects ($\gamma = 0$ in (2)). As mentioned in footnote 24, there is only one critical level of capital, k^c, in this case. At this point, the transition function is discontinuous: below (above) k^c, all corruptible bureaucrats are corrupt (non-corrupt) and the economy is on a low (high) capital accumulation path. If $k^c < k^*_{\mathrm{L}}$ ($k^c > k^*_{\mathrm{L}}$), then the economy undergoes complete transition towards k^*_{H} (is permanently trapped at k^*_{L}). The difference from the above analysis is that, if transition occurs, then it does so abruptly, rather than smoothly.

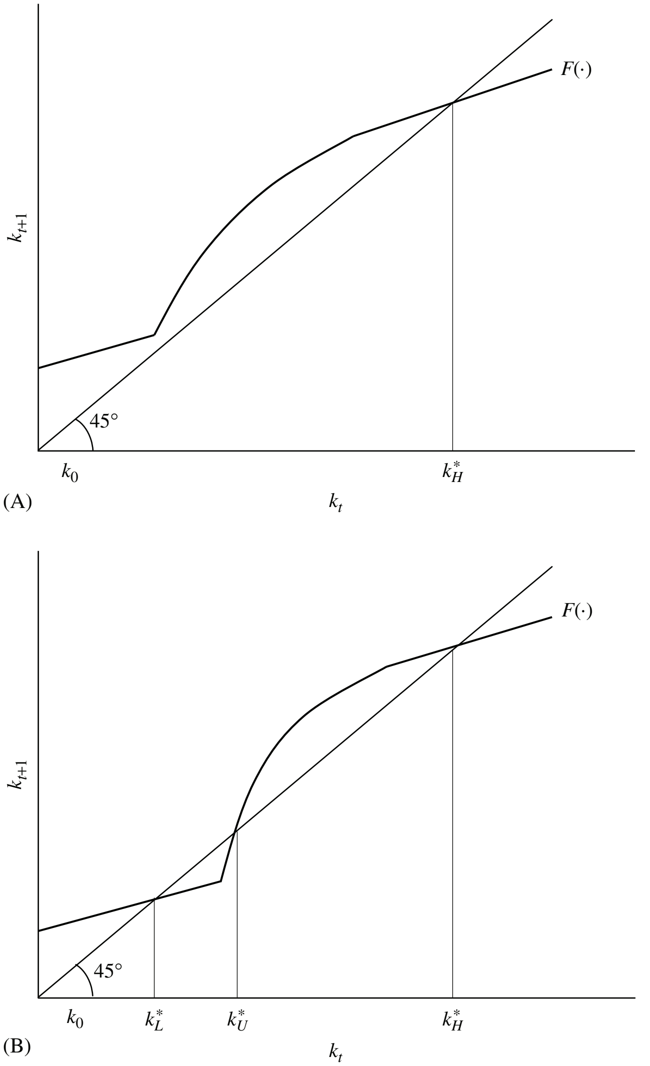

Fig. 2.

price. These features reflect the three main conditions for any type of corruption to occur – namely, that there is a delegation of authority from a principal to an agent, that this authority can be exploited to capture economic rents, and that these rents are large enough to motivate pursuit of them. Of course, to the extent that bribes are merely transfer payments from some individuals to others, corruption need not impose any net social costs. As with any illegal activity, however, at least some resources will be spent on trying to conceal rent-seeking behaviour. To the extent that these resources could have been devoted to more productive activities, then such behaviour will result in lower investment and lower capital accumulation. This is the mechanism by which corruption affects development in our model. At the same time, the incentives to be corrupt are likely to change with changes in economic circumstances. As growth takes place and incomes rise, agents will stand to lose more if they are caught engaging in corrupt practices which therefore become less attractive to them. This is the mechanism by which development affects corruption in the model. The upshot is that both corruption and development are determined endogenously through a relationship that is negative and two-way causal. The first property is consistent with all recent empirical evidence and accords with the majority view among development experts that corruption is bad for growth. The second property is notable in two other main respects which are worth reflecting upon.

At the theoretical level, two-way causality is understood to arise from the mutual interaction between bureaucratic decision making and aggregate economic activity. This interaction gives rise to (endogenous) threshold effects and the possibility of multiple (history-dependent) long-run equilibria. The existence of such equilibria means that countries with essentially the same structural characteristics, but different initial conditions, may face very different prospects as regards their economic development and quality of governance. In terms of the foregoing analysis, these prospects would look decidedly bleak for countries located below the threshold point k_{U}^{*}, unless there was the possibility of a fundamental adjustment that could produce a sudden turn of events. One such possibility is a windfall increase in the stock of capital that might allow the threshold to be breached. Another is a change in the value of some key structural parameter that may cause a favourable shift in the transition function and the threshold, itself. Yet even allowing for these events, it may still be difficult for some countries to escape from their predicament: switching from a state of low development to a state of intermediate or high development is a prospect that is more within the reach of those economies located relatively close to the threshold than those that lie relatively far away from it. In addition, if countries do not share the same structural characteristics, then there would be a distribution of transition paths and a distribution of limiting outcomes that would reflect similar divisions between poor and rich regions. Given all of this, then it is possible to explain not only why the incidence of corruption is so diverse among countries, but also why this diversity appears to be so persistent. Indeed, many countries of the world seem to have become trapped in a vicious circle of widespread poverty and wholesale misgovernance, concern over which has been growing visibly among international organisations.

At the empirical level, two-way causality is understood to be important for its potential to create problems of simultaneity bias in corruption-growth regressions. As indicated earlier, applied work on corruption using formal (econometric) analysis has flourished over recent years. Broadly speaking, this research has involved the estimation of various cross-country regressions to test certain hypotheses about the relationship between corruption (as measured by some corruption, or governance, index), development (as given by the level, or growth rate, of per capita income) and a number of other variables. Essentially, the investigations undertaken have comprised two types of analysis in which corruption and development have been regressed alternately on one another as researchers have sought to examine separately the key determinants of each. In both cases the typical approach has been to supplement simple ordinary least squares estimation with instrumental variables estimation as a means of correcting for any potential endogeneity. The results obtained indicate clearly that corruption and development are influenced strongly by each other. Yet although this is what theory predicts, one might wish to look for an alternative approach that comes closer to the spirit of two-way causality by allowing both directions of influence to be modelled jointly within the context of a single unifying framework. And this is not all – for our analysis suggests that there is more to the issue of simultaneity than simply the interdependence of variables: as noted above, there is also the phenomena of endogenous thresholds and the possibility of multiple development regimes. Beginning with the work of Hansen (1999, 2000), the econometric methodology and techniques for identifying such phenomena are now well-established and have been usefully applied in a number of fields (e.g., Chemlarova and Papageorgiou, 2005; Girma et al., 2002; Masanjala and Papageorgiou, 2004; Papageorgiou, 2002). As far as we know, the only application in the present field of inquiry is that of Haque and Kneller (2004) who find evidence that the relationship between corruption and development is, indeed, subject to threshold effects (manifesting in the form of data-determined changes in the estimated regression). Further research along the same lines would appear to be an exercise worth undertaking.

To date, relatively few attempts have been made to analyse corruption within a (dynamic) general equilibrium context. Only by doing this, however, is one likely to gain a clearer understanding of both the mechanism by which corruption affects the forces of development and the mechanism by which these forces, in turn, affect the incidence of corruption. Our intention in this paper has been to take a step forward in this direction.

Acknowledgements

The authors are grateful for the comments of an anonymous referee on an earlier version of the paper, and for the financial support of the ESRC (Grant Nos. L138251030, RES-000-22-0477). The usual disclaimer applies.

References

Acemoglu, D., Verdier, T., 1998. Property rights, corruption and the allocation of talent: a general equilibrium approach. Economic Journal 108, 1381–1403.

Acemoglu, D., Verdier, T., 2000. The choice between market failures and corruption. American Economic Review 90, 194–211.

Ades, A., Di Tella, R., 1997. The new economics of corruption: a survey and some new results. Political Studies 45, 496–515 (special issue).

Ades, A., Di Tella, R., 1999. Rents, competition and corruption. American Economic Review 89, 982–993.

Andvig, J.C., Moene, K.O., 1990. How corruption may corrupt. Journal of Economic Behaviour and Organisations 13, 63–76.
Banerjee, A.V., 1997. A theory of misgovernance. Quarterly Journal of Economics 112, 1289–1332.
Bardhan, P., 1997. Corruption and development: a review of issues. Journal of Economic Literature 35, 1320–1346.
Barreto, R.A., 2000. Endogenous corruption in a neo-classical growth model. European Economic Review 44, 35–60.
Barro, R.J., 1990. Government spending in a simple model of endogenous growth. Journal of Political Economy 98, S103–S125.
Basu, S., Li, D.D., 1998. Corruption in transition. University of Michigan Business School Working Paper No. 161.
Besley, T., McLaren, J., 1993. Taxes and bribery: the role of wage incentives. Economic Journal, 119–141.
Cadot, O., 1987. Corruption as a gamble. Journal of Public Economics 33, 223–244.
Carillo, J.D., 2000. Corruption in hierarchies. Annales d'Economie et de Statistique 10, 37–61.
Chand, S.K., Moene, K.O., 1997. Controlling fiscal corruption. IMF Working Paper No. WP/97/100.
Chemlarova, V., Papageorgiou, C., 2005. Non-linearities in capital-skill complementarity. Journal of Economic Growth, forthcoming.
Ehrlich, I., Lui, F.T., 1999. Bureaucratic corruption and endogenous economic growth. Journal of Political Economy 107, 270–293.
Fisman, R., Gatti, R., 2002. Decentralisation and corruption: evidence across countries. Journal of Public Economics 83, 325–345.
Frechette, G.R., 2001. An empirical investigation of the determinants of corruption: rent, competition and income revisted. Paper presented at the 2001 Canadian Economic Association Meeting.
Girma, S., Henry, M., Kneller, R.A., Milner, C., 2002. Threshold and interaction effects in the openness-productivity growth relationship: the role of institutions and natural barriers. Centre for Globalisation and Economic Policy Research Paper No. 02/32, University of Nottingham.
Gould, D.J., Amaro-Reyes, J.A., 1983. The effects of corruption on administrative performance. World Bank Staff Working Paper No. 580.
Gyimah-Brempong, K., 2002. Corruption, economic growth and income inequality in Africa. Economics of Governance 3, 183–209.
Hansen, B.E., 1999. Threshold effects in non-dynamic panels: estimation, testing and inference. Journal of Econometrics 93, 345–368.
Hansen, B.E., 2000. Sample splitting and threshold estimation. Econometrica 68, 575–603.
Haque, M.E., Kneller, R.A., 2004. Corruption clubs: endogenous thresholds in corruption and development. Centre for Globalisation and Economic Policy Research Paper No. 04/31, University of Nottingham.
Huntington, S.P., 1968. Political Order in Changing Societies. Yale University Press, New Haven.
Husted, B.W., 1999. Wealth, culture and corruption. Journal of International Business Studies 30, 339–360.
Jain, A.K. (ed.), 1998. The Economics of Corruption. Kluwer Academic Publishers, Dordrecht, MA.
Jain, A.K., 2001. Corruption. Journal of Economic Surveys 15, 71–121 (a review).
Kauffman, D., Wei, S.-J., 2000. Does 'grease money' speed up the wheels of commerce? IMF Working Paper No. WP/00/64.
Keefer, P., Knack, S., 1997. Why don't poor countries catch up? A cross-national test of an institutional explanation. Economic Inquiry 35, 590–602.
Klitgaard, R., 1988. Controlling Corruption. University of California Press, Berkeley.
Klitgaard, R., 1990. Tropical Gangsters. Basic Books, New York.
Klitgaard, R., 1991. Adjusting to Reality: Beyond State Versus Market in Economic Development. ICS Press and International Centre for Economic Growth, San Francisco.
Knack, S., Keefer, P., 1995. Institutions and economic performance: cross-country tests using alternative institutional measures. Economics and Politics 7, 207–227.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 1999. The quality of government. Journal of Law, Economics and Organisation 15, 222–279.

Leff, N.H., 1964. Economic development through bureaucratic corruption. In: Jain, A.K. (Ed.), The Economics of Corruption. Kluwer Academic Publishers, Dordrecht, MA.
Leys, C., 1970. What is the problem about corruption? In: Heidenheimer, A.J. (Ed.), Political Corruption: Readings in Comparative Analysis. Holt Reinehart, New York.
Li, H., Xu, L.C., Zou, H., 2000. Corruption, income distribution and growth. Economics and Politics 12, 155–182.
Lui, F., 1985. An equilibrium queuing model of corruption. Journal of Political Economy 93, 760–781.
Masanjala, W., Papageorgiou, C., 2004. The Solow model with CES technology: non-linearities and parameter heterogeneity. Journal of Applied Econometrics 17, 171–201.
Mauro, P., 1995. Corruption and growth. Quarterly Journal of Economics 110, 681–712.
Mauro, P., 1997. The effects of corruption on growth, investment and government expenditure: a cross-country analysis. In: Elliott, K.A. (Ed.), Corruption and the Global Economy, Institute for International Economics, Washington, DC.
Mookherjee, D., Png, I.P.L., 1995. Corruptible law enforcers: how should they be compensated? Economic Journal 105, 145–159.
Montinola, G.R., Jackman, R.W., 1999. Sources of corruption: a cross-country study. British Journal of Political Studies 32, 147–170.
Paldam, M., 2002. The big pattern of corruption, economics, culture and seesaw dynamics. European Journal of Political Economy 18, 215–240.
Papageorgiou, C., 2002. Trade as a threshold variable for multiple regimes. Economics Letters 77, 85–91.
Rauch, J.E., Evans, P.B., 2000. Bureaucratic structure and bureaucratic performance in less developed countries. Journal of Public Economics 76, 49–71.
Rijckeghem, C.V., Weder, B., 1997. Corruption and the rate of temptation: do low wages in the civil service cause corruption? IMF Working Paper No. WP/97/73.
Rose-Ackerman, S., 1975. The economics of corruption. Journal of Public Economics 4, 187–203.
Rose-Ackerman, S., 1978. Corruption: A Study in Political Economy. Academic Press, New York.
Rose-Ackerman, S., 1996. Democracy and the 'grand' corruption. International Social Science Journal 158, 365–380.
Rose-Ackerman, S., 1997. The role of the World Bank in controlling corruption. Law and Policy in International Business 29, 93–114.
Rose-Ackerman, S., 1998. Corruption and development. Annual World Bank Conference on Development Economics, 1997, 35–57.
Rose-Ackerman, S., 1999. Corruption and Government: Causes, Consequences and Reform. Cambridge University Press, Cambridge.
Sachs, J.D., Warner, A.M., 1997. Sources of slow growth in African economies. Journal of African Economics 6, 335–376.
Sah, R.K., 1988. Persistence and pervasiveness of corruption: new perspectives. Yale Economic Growth Research Centre Discussion Paper No. 560.48.
Sah, R.K., 1991. Social osmosis and patterns of crime. Journal of Political Economy 99, 1272–1295.
Sarte, P.-D., 2000. Informality and rent-seeking bureaucracies in a model of long-run growth. Journal of Monetary Economics 46, 173–197.
Shleifer, A., Vishny, R., 1993. Corruption. Quarterly Journal of Economics 108, 599–617.
Tanzi, V., Davoodi, H., 1997. Corruption, public investment and growth. IMF Working Paper No. WP/97/139.
Tirole, J., 1996. A theory of collective reputation (with applications to the persistence of corruption and firm quality). Review of Economic Studies 63, 1–22.
Treisman, D., 2000. The causes of corruption: a cross-national study. Journal of Public Economics 76, 399–457.
United Nations, 1989. Corruption in Government. United Nations, New York.
Wade, R., 1985. The market for public office: why the Indian state is not better at development. World Development 13, 467–497.