Financial Liberalisation, Bureaucratic Corruption and Economic Development

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This paper analyses the impact of international financial liberalisation on corruption and economic development. We use a dynamic general equilibrium model in which corruption and growth are jointly determined. Corruption arises when corruptible bureaucrats find it beneficial to steal a fraction of the government expenditure under their responsibility. In accordance with recent empirical evidence the model predicts that capital account liberalisation is growth enhancing in developed countries although increases corruption and may reduce capital accumulation in poor countries.

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1. Introduction

There exists a general consensus among economists that trade liberalisation fosters growth. However, there is no such consensus with respect to the growth-enhancing effects of international financial liberalisation. The advocates of the elimination of capital controls make an analogy with free trade by arguing that financial liberalisation promotes a better allocation of resources. In addition, they argue that the removal of barriers to capital flows increases the efficiency of the financial sector and improves risk diversification positively affecting economic growth in the long run. In contrast, the critics of international financial liberalisation highlight that liberalising the capital account in emerging countries with

fragile financial systems can cause severe financial instability. The Asian crisis of the 1990s has been widely used as an illustration of this point of view. Under the presence of distortions in the domestic financial markets, such as unlimited government guaranties or other safety net mechanisms, opening the capital account may only increase the incentives for raising exposure. Moreover, capital flows could become counter-cyclical if the local or international environment becomes unstable. Investors will be willing to invest in a country only when the economic situation is fine and stable but they will flee at the first sign of crisis or instability. Many empirical studies have been conducted to test these antagonistic positions. However, the results are inconclusive. Some analyses have found a significant positive link between financial liberalisation and growth but others have put in doubt its growth-enhancing effects for developing countries. For extensive surveys see Eichengreen (2001) and Edison et al. (2002).

In spite of all the efforts that have been put into this debate, little attention has been given to the role of corruption in determining the effects of financial liberalisation. However, there are good reasons for thinking that the quality of governance is an important factor.

First, there are numerous examples of individuals that use overseas accounts to store illegal income. The total amount of stolen resources that Ferdinand Marcos took outside of the Philippines is still subject of debate. However, there is evidence that Marcos offered to repatriate US$5 billion in exchange of being allowed to return to his country without prosecution.[1] Another dramatic example was observed in Congo (then Zaire) under the regime of Mobutu Sese Seko. It has been reported that by the mid-1980s he already had a personal fortune of US$ 4 billion and of course a large portion

[1] "Marcos Bids $5 Billion to Return to Philippines," Los Angeles Times, 26 July 1988.

of it was held abroad.[2] Nigeria also suffered a massive outflow of embezzled resources under the regime of General Sani Abacha. The Nigerian government in 1999 ordered to freeze a Swiss bank account belonging to Abacha's family and for their surprise they found that the account had a balance of nearly US$ 2 billion.[3] In addition, there is evidence that General Abacha's family maintained multimillionaire accounts in London and New York as well.[4] Finally, it is estimated that the former head of State of Mali, Moussa Traore, has a personal fortune amassed by looting public funds equivalent to Mali's foreign debt (US$2 billion). It is estimated that most of these funds are hold abroad.[5]

Latin American leaders and civil servants are also famous for hiding the proceeds of corruption overseas (mainly in the US). Recently, the Department of Homeland Security of the United States of America is investigating dubious accounts belonging to former Latin American public servants that are held in the US. The former president of Nicaragua Arnoldo Alemán and his right-hand man Byron Jerez are being under scrutiny for siphoning US$100 million in public funds that it is suspected are deposited in a Bank in Miami.[6] Other ex-leaders that are under investigation are the former president of Ecuador Gustavo Noboa and the former president of Guatemala Alfonso Portillo. It is suspected that they hold large amounts of embezzled funds in private accounts in the American financial system.[7]

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[2] "How Mobutu Built Up His $4 Billion Fortune: Zaire's Dictator Plundered IMF Loans", Financial Times, 12 May 1997

[3] "Going after the 'Big Fish,' New Nigerian President Trawls for Corruption", International Herald Tribune, 25 November 1999.

[4] "Panel to Focus in US Banks and Deposits by Africans", New York Times, 5 November 1999 and "Hearing Offer View into Private Banking", New York Times, 8 November 1999

[5] This and many other outrageous examples from the African continent can be found in the Free Africa Foundation website at www.freeafrica.org.

[6] Arnoldo Alemán has been sentenced to 20 years in prison for embezzlement of public funds on December 2003.

[7] "Harder Graft", *The Economist*, April 7th 2004.

The case of Russia is particularly interesting given that capital account liberalisation in the early 1990s was accompanied by a massive capital flight. According to Abalkin and Whalley (1999), between January 1994 and September 1997, Russian residents managed to accumulate abroad US$68 billion, from which they estimate that 33 percent come from an illegal origin and 37 from a semi-legal source. It is impossible to distinguish between corruption and other sources of illegal activities. Nevertheless, considering that Russia is ranked as one of the most corrupt countries in the World, it is not difficult to infer that an important fraction of the observed capital flight during this period was originated by corruption.

Second, there is evidence that financial liberalisation fosters corruption in developing countries. So far, the econometric studies that have analysed the link between corruption and economic freedom[8] have constantly reported a negative relationship between these two variables (e.g. Paldam, 2002). It seems that the higher the level of economic freedom the lower the level of corruption. However, Graeff and Mehlkop (2003) by decomposing the economic freedom index in their constituent parts and distinguishing between developed and developing countries have found that there is a significant positive relationship between corruption and international financial liberalisation in poor countries.

[8] Economic freedom is measured by the index of economic freedom of the Frasier Institute in Vancouver, Canada. This index is still a work in progress and has experienced some changes since its first publication in the mid 1990s. The 2004 index evaluates the degree of economic freedom in 5 mayor areas, namely: size of government, legal structure and security of property rights, access to sound money, freedom to trade internationally and regulation of credit, labour, and business. Each of these areas is divided respectively in sub-areas. From the very beginning, the constructors of this index have tried to avoid subjective information relying only on objective components that can be derived for a large number of countries from regularly published sources. However, since the publication of *The Economic Freedom of the World: 2001 Annual Report* the index contains survey data to quantify some dimensions of economic freedom that are difficult to measure. For more information on the index visit The Frasier Institute web site at: http://www.fraserinstitute.ca/economicfreedom/index.asp?snav=ef.

Third, there is evidence that corruption affects development only in open economies. In a recent working paper, Neeman et al. (2004) report an astonishing stylised fact that until now has eluded the attention of researchers. These authors find that in open economies there is a strong negative relationship between corruption and development that cannot be identified in closed economies. [9] This stylised fact has been proved to be robust to a diversity of empirical specifications. A negative relationship between corruption and development has constantly been reported (Treisman, 2000; Tanzi and Davoodi, 2000 and Paldam, 2002). The studies have shown a general negative association presumably because they have used a higher proportion of open countries in smaller samples.[10] Neeman et al. (2004) used a considerable sample of 133 countries from which 96 were classified as open and 37 as closed.

Another interesting result of Neeman et al. (2004) is that financial openness appears to be the main determinant of the degree in which corruption affects the level of output. If they run their regressions using only trade openness their results become inconclusive. On the contrary, if they compute their regressions using financial openness as a measure of aggregate economic openness, they obtain the same results (i.e. a strong negative relationship between corruption and development for the case of open economies and no link for the case of closed economies). Supporting

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[9] The authors use Wacziarg and Welch (2003) classification of open and closed economies that is an update of the widely used Sachs and Warner (1995) categorisation. According to this classification, an economy is considered closed if it displays any of the following characteristics. Average tariff rates of 40% or more; non-tariff barriers covering 40% or more of trade; a black-market exchange rate that is depreciated by 20%, or more, relative to the official exchange rate; a state monopoly on major exports; and a socialist economic system. In addition, is pertinent to mention that Neeman et al. (2004) measure the level of development as the GDP per capita expressed in purchasing power parity terms.

[10] The samples considered by these studies are between 60 -100 countries. Furthermore, the corruption indicators were available mostly for open countries in previous years. This situation could have created a bias towards open countries.

the findings of Mauro (1995), Neeman et al. (2004) also demonstrate that the main channel by which corruption affects output is physical capital accumulation. It is not difficult to understand why this is the case. Once a country opens its frontiers to international capital flows the proceeds of corruption are taken abroad in order to lower the probability of detection, reducing the amount of domestic savings available for investment. Of course, the more developed the country (and thus the lower the level of corruption), the less significant is the negative impact of international financial liberalisation.

There are very few theoretical analyses of the relationship between corruption, international financial liberalisation and economic development. One exception is the paper by Rivera-Batiz (2001). The model provides a theoretical framework to illustrate how financial liberalisation under certain conditions could stimulate capital flight. Corruption is assumed to act as a tax on firms that innovate and produce new goods in the economy. When the level of corruption is high enough (causing the net of bribes domestic rate of return to capital before liberalisation to be below those in the rest of the world), then the removal of barriers to international financial transactions generates capital flight and a fall in economic growth. In contrast, when the level of corruption is sufficiently low, financial liberalisation will attract capital to the economy, boosting technological change and development. The other exemption is our paper.

We use a dynamic general equilibrium model for an artificial economy in which the level of corruption is endogenously determined with other aggregate outcomes. The government employs bureaucrats to collect tax revenue and provide public goods on its behalf. However, the government cannot perfectly monitor the actions of its employees. Therefore, corruptible bureaucrats have the incentive to embezzle a fraction of the funds under

their responsibility. Corruption both influence and is influenced by economic development in a negative two–way causal relationship. Consequently, the model presents threshold effects and multiple development regimes: low levels of development with high corruption and high levels of development with low corruption. Depending on the initial conditions the transition between regimes may not be feasible (poverty trap equilibrium). Using this framework we analyse the impact of international financial liberalisation on corruption and economic development abstaining from any discussion of international trade. This means that our analysis focuses on financially open economies (i.e. countries that impose no restrictions to international capital flows) and financially closed economies (i.e. countries that are closed to international capital flows). The model predicts that corruption both influences the effects, and is influenced by the extent of financial liberalisation. We find that capital account liberalisation is growth-enhancing in rich countries but generates an increase in the level of corruption and may reduce capital accumulation in poor countries.

The remainder of the paper is organised as follows. In Section 2 we describe the set-up of the economy. In Section 3 we identify the conditions under which corruption occurs. In Section 4 we study the interaction between corruption and development in a financially closed economy. In Section 5 we open up the economy to international capital flows. Finally, In Section 6 we make a few concluding remarks.

2. The Environment

Time is discrete and indexed by $t = 0,...,\infty$. There is a constant population of two-period-lived agents belonging to overlapping generations.

According to their skills, agents at each period of time are divided into two groups – private individuals (or households) and public officials (or bureaucrats). Households, of whom there is a constant measure of mass *M*, work for private firms that produce final goods. Public officials, of whom there is a fixed measure of mass $N < M$,[11] work for the government. Corruption arises because corruptible civil servants may choose to steal a portion of the resources under their responsibility given that it is extremely expensive for the government to have perfect control over the administration of public expenditure. All agents are risk neutral, working (and saving) only in the first period of their lives (when young) and consuming in the second period (when old). There are two types of firms – producers of capital and producers of final goods. There is a unity mass population of each kind of producer. Households and public officials lend their savings to capital producers, which in turn rent capital to output producers.

2.1 The Government

The government imposes on every young household a lump-sum tax t_t to finance the provision of public goods and services. Public officials by the authority delegated by the government are responsible for the collection of taxes and the execution of public expenditure. For simplicity, we assume that bureaucrats are not liable to taxation. The identity of all agents is public knowledge, this means that a household cannot pretend to be a bureaucrat

[11] We assume that only public servants have the ability to work for the government and hence they are induced to become civil servants by an allocation of talent condition established below.

and vice versa. Moreover, since the same lump sum tax is equally imposed on all households, tax evasion is ruled out in the model.[12]

The government determines the level of wages to be paid to the bureaucracy taking into account the following considerations. Either a bureaucrat or a household can work for a private firm in exchange of a salary. Any bureaucrat willing to accept a lower salary than this wage is expected to supplement his income by engaging in corruption and is therefore automatically exposed. We assume that the government confiscates all the income of a corrupt bureaucrat that is discovered engaging in dishonest behaviour.[13] Hence, no bureaucrat would ever reveal himself by accepting a lower salary than the remuneration that he could get working elsewhere. In order to attract individuals with the talent for civil service while minimising labour costs the government will pay bureaucrats the same wage that they would obtain working for a private firm.

Public expenditure in public goods and services, g_t, enters the production function of the producers of final goods as in Barro (1990) and it is assumed to be a fixed proportion $g \in (0,1)$ of output. Corruption arises because the government cannot perfectly monitor the use of public funds. Thus, corruptible bureaucrats have incentives to embezzle a fraction of the tax revenue by declaring that the amount of resources needed to finance public expenditure is higher than it actually is. The government knows how much revenue is collected each period and has estimates of the amount of public expenditure. If the actual amount of government expenditure is higher that

[12] In other models such as in Blackburn and Forgues-Puccio (2004), only high-income households are liable for taxation and even though the identity of agents (whether they are households or bureaucrats) is public knowledge, the identity of the rich is private information. Thus, high-income households have the incentive to collude with a corruptible bureaucrat to pass as a non high-income household to evade the payment of duties in exchange for a bribe.

[13] This kind of punishment is not rare in the literature on corruption (e.g. Acemoglu and Verdier, 1998).

the estimated amount the government will suspect that corruption is taking place. In order to investigate the behaviour of bureaucrats the government sets a monitoring technology. This technology is costly and involves d units of additional expenditure; is also imperfect though, since the government cannot spend unlimited resources in monitoring corruption. Therefore, a corrupt bureaucrat faces a probability $p \in (0,1)$, of avoiding detection, and a probability, $(1-p)$, of being caught.

The government runs a balanced budget each period. Revenue comes from lump-sum taxes on households and fees charged to public servants that are caught engaging in corruption. Government expenditure is distributed between public servants wages, an imperfect monitoring mechanism to detect corruption, and the provision of public goods and services including any possible embezzlement from corrupt bureaucrats. Any shortage of revenue is financed by an increase in the tax rate. In other words, t_t is residually determined from the government budget.

2.2 Firms

There are two types of firms in this economy. One type produce final goods (output producers) and the other type transform private savings into capital (capital producers).

2.2.1 Output producers

There is a constant unit mass of identical output producers. The representative firm hires labour h_t from households and rents capital k_t from capital producers to produce output y_t using the following technology:

$$y_t = Ah_t^a k_t^{1-a} g_t^a \tag{1}$$

where $A > 0$ and $a \in (0,1)$. Labour and capital are hired and rented in competitive markets at the wage rate w_t and the rental rate r_t respectively. The utility of output producers is linear on profits. Profit maximisation implies $w_t = aAh_t^{a-1} k_t^{1-a} g_t^a$ and $r_t = (1-a)Ah_t^a k_t^{-a} g_t^a$. In equilibrium, $h_t = lm$ and $g_t = gy_t$ by assumption. Hence, we may write these conditions as

$$w_t = \left(\frac{aa}{lm} \right) k_t \tag{2}$$

$$r_t = a(1-a) \tag{3}$$

where $a = [A(lmg)^a]^{1/(1-a)}$. By writing the profit maximisation conditions in this form we have that the equilibrium wage is proportional to the capital stock and the interest rate that output producers pay to capital producers is constant and equal to *r*.

2.2.2 Capital producers

There is a constant unit mass of homogeneous capital producers. Each firm of this type contract loans l_t from households and bureaucrats at the interest rate I_{t+1} and transform them into capital k_{t+1} using the following technology:

$$k_{t+1} = e_t l_t \tag{4}$$

where e_t is effort put in the production of capital. It is assumed that households and bureaucrats can lend their savings to capital producers or choose another alternative investment that pays the constant interest rate *R*. Capital producers hence face the following participation constraint: $I_{t+1} \geq R$. To participate in the market, capital producers will have to pay agents an interest rate at least or equal to *R*.[14] Capital producers derive utility from profits and disutility from the effort that they put in the production of capital according to the following utility function: $\log\{[re_t - (1+I_{t+1})]l_t\} - f e_t$, where $f > 0$ is a parameter.[15] Maximising the utility function of capital producers subject to their participation constraint, we find that the optimal interest rate that is paid to lenders is equal to R and the optimal level of effort is constant through time and equal to the following expression:

$$e = \frac{r + f(1+R)}{fr} \tag{5}$$

Notice from (5) that $e > 0$ and that the optimal level of effort is an increasing function of the interest rate paid in the alternative investment *R* ($\partial e/\partial R > 0$) and a decreasing function of the rental rate of capital paid by output producers ($\partial e/\partial r < 0$).

[14] It is assumed that agents will choose to lend their savings to capital producers if they are indifferent between this option and the alternative investment.

[15] We can think of f as the marginal cost of effort.

2.3 Households

Households are endowed with l units of labour that they supply inelastically to firms that produce final goods in exchange of a wage, w_t. Since all agents in the economy consume only in the second period of their lives, households save their entire income when young and lend it to capital producers at the interest rate, R. In addition, households receive a bequest, q_t, from their parents. Households derive utility from consumption when old and from leaving bequests to their offspring, q_{t+1}, according to the following utility function: $(1+R)z_{ht} - q_{t+1} + u_h(q_{t+1})$, where z_{ht} is income in period t and $u_h(\cdot)$ is a twice-differentiable concave function. Utility maximisation implies that $u'_h(q_{t+1}) = 1$, which in turn means that $q_{t+1} = q_t = q$. The size of the bequest is constant through time and is equal to the fixed amount q. Given the above information and considering that the government charges each family the lump-sum tax, t_t, the income of a household is equal to the following expression:

$$z_{ht} = l w_t - t_t + q \tag{6}$$

In the same fashion, the utility of households can be summarised as:

$$U_{ht} = (1+R)\left[l w_t - t_t\right] + Rq + u_h(q) \tag{7}$$

2.4 Bureaucrats

The population of bureaucrats is divided into a fraction, $n \in (0,1)$, of corruptible bureaucrats and a remaining fraction $1-n$ of non-corruptible bureaucrats. It is assumed that the government has no way of identifying a priori the identity of a particular civil servant. Bureaucrats are endowed with one unit of labour that they supply inelastically to the government in exchange of the wage rate w_t. As discussed earlier, this wage is set equal to the salary that a bureaucrat could earn working for a private producer of output. To simplify the analysis it is assumed that bureaucrats have no other sources of legal income. Bureaucrats lend the savings that accumulate when young to firms that produce capital in exchange of the interest rate R.

Non-corruptible bureaucrats derive utility from consumption when old according to the following utility function $(1+R)z_{nt}$, where z_{nt} is income when young. Corruptible bureaucrats also derive utility from consumption in the second period of their lives. However, engaging in corruption has two effects on their utility. First, the income of a corrupt bureaucrat now becomes a random variable. With probability p a corrupt public official avoids detection and retains his wage plus the amount that is embezzled from the government and with probability $(1-p)$ his whole income is confiscated. Second, committing corrupt acts reduces the utility (disutility) of a corrupt civil servant because of the moral distress that involves misbehaving. The following expression summarises the expected utility of a corruptible bureaucrat $(1+R)E(z_{ct})-v_B(x_t)$, where $E(z_{ct})$ is expected

income, x_t is the amount that is stolen from the government and $v_B(\cdot)$ is a twice-differentiable convex function.[16]

Given the previous information the expected income of a corruptible bureaucrat is equal to $p(w_t + x_t)$ and the embezzled (stolen) amount that maximises his utility is obtained by setting $v_B'(x_t) = (1+R)p$, which implies $x_t = x = x(R, p)$ with $\partial x/\partial R > 0$ and $\partial x/\partial p > 0$. The amount of resources that each corruptible bureaucrat embezzles is a function of the interest rate that the bureaucrats receive from lending their savings to capital producers, *R*, and the probability of avoiding detection, *p*. Since both *R* and *p* are constant through time the stolen amount is fixed and equal to *x*. The income profile of the bureaucrats can be summarised as follows:

$$z_{nt} = w_t \tag{8}$$

$$z_{ct} = \begin{cases} w_t & \text{if} \quad x = 0 \\ w_t + x & \text{with prob. } p \quad \text{if } x > 0 \\ 0 & \text{with prob. } 1-p \quad \text{if } x > 0 \end{cases} \tag{9}$$

In the same fashion, the utility profile of bureaucrats can be summarised as:

$$U_{nt} = (1+R)w_t \tag{10}$$

$$U_{ct} = \begin{cases} (1+R)w_t & \text{if } x = 0 \\ (1+R)\,p[w_t + x] - v(x) & \text{if } x > 0 \end{cases} \tag{11}$$

[16] Non-corruptible bureaucrats can be interpreted as having infinite disutility from corruption.

3. The Incentive to be Corrupt

Corruption arises because the government cannot perfectly monitor the final destination of government spending. Thus, corruptible bureaucrats have incentives to embezzle a fraction of tax revenue by declaring that the amount of resources needed to finance public expenditure is higher than it actually is. A corruptible bureaucrat will choose to behave in this manner if the expected utility of doing so is greater than the expected utility of being honest.

The expected utility of engaging in corruption and the expected utility of remaining "clean" are deducted from (11); and they are respectively $E\left(U_{ct}/x>0\right)=(1+R)p[w_t+x]-v(x)$ and $E\left(U_{ct}/x=0\right)=(1+R)w_t$. If $E\left(U_{ct}/x>0\right)\geq E\left(U_{ct}/x=0\right)$ then the corruptible bureaucrat has an incentive to embezzle public funds.[17] This condition may be stated as:

$$(1+R)px-v(x)\geq(1+R)(1-p)w_t \qquad (12)$$

The intuition behind this expression is that a bureaucrat will engage in corruption if the net expected benefit from embezzlement, exceeds, or at least is equal to the expected loss in legal income if he is exposed. Replacing (2) into (12) and rearranging the terms we can find the critical level of capital Ω below which corruption takes place and above which corruption is absent in the economy:

[17] To break the knife edge equilibrium, it is assumed that a bureaucrat that is indifferent between embezzling public funds or being honest will choose to engage in corruption.

$$k_t \leq \frac{lm[(1+R)px - v(x)]}{aa(1+R)(1-p)} \equiv \Omega = \Omega(R, p) \qquad (13)$$

The previous condition reflects the fact that higher levels of capital, which are related with higher levels of wages, imply a higher expected opportunity cost of engaging in corruption and thus creates disincentives to embezzle public funds. Consistent with empirical evidence, our model predicts that development has an unambiguously positive impact on reducing corruption. Notice also that Ω is a function of the interest rate paid by capital producers to lenders, *R*, and the probability of avoiding detection, *p*. It is straightforward to verify that $\partial\Omega/\partial R > 0$ and $\partial\Omega/\partial p > 0$.

4. Corruption and Development in a Financially Closed Economy

In what follows we are going to use the assumptions and results of sections 2 and 3 combined with other additional assumptions required for this section. First, we define a financially closed economy as a country that imposes significant barriers to cross-border financial transactions.[18] In this kind of environment households and bureaucrats do not have access to the international financial market and therefore storage is the only alternative to lending. It is assumed that storage pays a constant interest rate equal to $\hat{R}$. We also assume that in a closed economy a corruptible bureaucrat faces a probability of avoiding detection equal to $\hat{p}$. Even though this probability is constant, we can think of $\hat{p}$ as depending on the features of this economy

[18] From now on we will use financially closed (open) economy or just closed (open) economy indistinctly.

(i.e. amount spent by the government in monitoring bureaucrats and barriers to capital flows).[19] Given the previous information we can identify the optimal level of effort in the production of capital as $\hat{e} = \frac{r + f\left(1 + \hat{R}\right)}{fr}$, and the optimal amount to be embezzled by a corrupt bureaucrat as $\hat{x}$, which is a function of both $\hat{R}$ and $\hat{p}$. Observe that by (13) the critical level of capital below which corruption takes place and above which corruption is absent is also a function of both $\hat{R}$ and $\hat{p}$. Hence for a closed economy we rename this critical value as $\hat{\Omega}$.

Now, consider the case in which the level of capital is above $\hat{\Omega}$. In other words, condition (12) is violated and corruption is absent in the economy. In this scenario, all bureaucrats are honest and the taxes collected from households, Mt_t, are used by the government to pay salaries to public officials, Nw_t, and the provision of public goods and services, g_t. The government's budget constraint in the absence of corruption is then:

$$Mt_t = Nw_t + g_t \tag{14}$$

The capital accumulation path is derived using the equilibrium condition in the loans market that the total demand for loans by capital producers is equal to the savings of all agents. Since the population of capital producers is indexed to one, the equilibrium condition is simply $l_t = \hat{s}_t$, where $\hat{s}_t$ are total savings. Using this condition and replacing (5) into (4) we obtain the equation that describes the capital accumulation path for this economy:

[19] In order to avoid detection a corrupt bureaucrat will have to conceal the proceeds of corruption in the first period of his life. Notice that in a financially closed economy the

$$\hat{k}_{t+1} = \left[\frac{r + f\left(1 + \hat{R}\right)}{fr} \right] \hat{s}_t \tag{15}$$

Consequently, the amount of capital in the next period is not only a function of the amount of total savings available in the current period, but is also a function of the interest rate that is paid by the alternative investment. When corruption is absent in the economy total savings are equal to savings from households, $M\left(l\,w_t - t_t + q\right)$, plus savings from bureaucrats, Nw_t. Using (14) for total tax revenue, (2) for wages and finally the fact that the provision of public goods and services can be expressed as $g_t = ag\,k_t$, we find that total savings in the absence of corruption may be described as:

$$\begin{aligned} \hat{s}_t &= M l w_t - g_t + Mq \\ &= a(a - g)\,k_t + Mq \end{aligned} \tag{16}$$

After replacing (16) into (15) the capital accumulation path for a non-corrupt closed economy is equal to the following expression:

$$\hat{k}_{t+1} = \hat{e}\left[a(a - g)\,k_t + Mq\right] \equiv \hat{f}_{nc}(k_t) \tag{17}$$

Considering that the amount of bequests is always positive and assuming that $\hat{e}a(a - g) < 1$, the steady state of a non-corrupt financially closed economy is $\hat{k}^*_{nc} = \dfrac{Mq}{1 - \hat{e}a(a - g)}$.

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corrupt bureaucrat is more exposed to detection because he cannot hide his illegal income abroad.

Consider the case in which the level of capital is below $\hat{\Omega}$, which means that condition (12) is satisfied and corruption is present in the economy. A fraction $\hat{p}$ from the total population of corrupt bureaucrats, nN, evade detection and enjoys the additional income, $\hat{x}$, while a fraction $1-\hat{p}$ are exposed and their whole income confiscated. Thus, the government revenue is the sum of taxes collected from households, Mt_t, plus the total amount of fines imposed on corrupt officials, $(1-\hat{p})nN[w_t+\hat{x}]$.[20] As in the case in which corruption is absent, the government uses this revenue to finance the bureaucrats pay roll, Nw_t, and the provision of public goods and services, g_t. However, in a corrupt environment, the government has to finance a monitoring mechanism to verify the honesty of bureaucrats, which entails the amount *d*, and also is subjected to the misappropriation of public funds, $nN\hat{x}$. Given the above information the government's budget constraint under the presence of corruption may be represented by:

$$Mt_t = [1-(1-\hat{p})n]Nw_t + g_t + d + \hat{p}nN\hat{x} \qquad (18)$$

The capital accumulation path in a corrupt environment is also described by equation (15). However, the amount of total savings is different when corruptible public officials have incentives to misbehave. The amount that is saved by households remains the same as in a non-corrupt environment and is equal to $M(lw_t - t_t + q)$. On the contrary, the savings of bureaucrats now depend on their inclination to be corrupt. The savings of non-corruptible bureaucrats are equal to $(1-n)Nw_t$, while the savings of corruptible

[20] Remember that tax evasion is ruled out in the model given that the identity of all agents is public knowledge and the same lump sum tax is equally imposed on all households.

bureaucrats are $\hat{p}nN(w_t + \hat{x})$. Using equation (18) for the total tax revenue in a corrupt environment, equation (2) and the fact that the government expenditure in public goods and services can be written as $g_t = ag\,k_t$, we can summarise total savings under the presence of corruption as:

$$\begin{aligned} \hat{s}_t &= Ml\,w_t - g_t - d + Mq \\ &= a(a - g)\,k_t - d + Mq \end{aligned} \tag{19}$$

Replacing (19) into (15) we may describe the capital accumulation path of a financially closed economy affected by corruption as:

$$\hat{k}_{t+1} = \hat{e}\left[a(a - g)\,k_t - d + Mq\right] \equiv \hat{f}_c(k_t) \tag{20}$$

Assuming that $Mq > d$, and $\hat{e}a(a - g) < 1$ as before, the steady state of a corrupt closed economy is $\hat{k}_c^* = \dfrac{Mq - d}{1 - \hat{e}a(a - g)}$. Notice that $\hat{k}_c^* < \hat{k}_{nc}^*$, because $d > 0$. The intuition behind this result is that public funds in a corrupt environment are wasted monitoring the misuse of public office.

A complete characterisation of the dynamic general equilibrium for this financially closed economy is depicted in Figure 1. Notice that if $k_t \le \hat{\Omega}$, then the economy is on the low capital accumulation path described by equation (20). In contrast, if $k_t > \hat{\Omega}$, then the economy is on the high capital accumulation path described by equation (17). Depending on the initial level of capital and the position of the critical value $\hat{\Omega}$, an economy could in principle be trapped in an undesirable equilibrium with low levels of development and persistent corruption. Consider the case in which

$k_0 < \hat{k}_c^* < \hat{\Omega}$ or $\hat{k}_c^* < k_0 < \hat{\Omega}$. In this scenario, the economy will converge to the low-development/high-corruption steady state before it can make the leap to the high capital accumulation path that leads to the high-development/low-corruption steady state. In contrast, consider the case in which $k_0 < \hat{\Omega} < \hat{k}_c^*$, in this setting an economy will successfully make the transition from a low capital accumulation path to a high capital accumulation path enjoying in the long run, high levels of development and transparency. However, there is nothing in the model, which ensures that an economy will successfully make the transition.

5. Corruption and Development in a Financially Open Economy

Once again, we use the results and assumptions of sections 2 and 3. However, the framework for this section is now for a small financially open economy. We define a financially open economy as a country in which there are no barriers to cross-border financial transactions. In this environment, the alternative investment is the international financial market, which pays the world interest rate $\tilde{R} > \hat{R}$. In this scenario, capital producers will have to offer lenders at least the same interest rate that they could get abroad if they intend to continue participating in the market. Remember that the optimal amount of effort is a function of the interest rate that is paid by the alternative investment. Therefore, under financial liberalisation capital producers will find it optimal to increase their productivity $\tilde{e} > \hat{e}$. This result is consistent with recent empirical evidence that financial liberalisation enhances the functioning of financial intermediation (Levine, 2001). However, this unambiguous positive effect of financial liberalisation,

has to be measured against the impact on corruption of removing the barriers to capital flows.

In an open economy it would be expected that a corruptible bureaucrat would face a different probability of eluding exposure. Considering a probabilistic approach, the number of places (countries) in which a corrupt bureaucrat may hide the proceeds of corruption is higher in an open economy. We identify the probability of avoiding detection as $\tilde{p} > \hat{p}$. Given that the optimal amount of resources that each corruptible bureaucrat embezzles is a function of both $\tilde{R}$ and $\tilde{p}$, higher interest rates for loans and a higher probability of avoiding detection imply that each corruptible bureaucrat will choose to embezzle a higher amount of public funds in an open economy than in a closed economy. Hence, in spite of the fact that the population of corruptible bureaucrats remains constant, the total amount that is stolen from the government is greater in an economy with no restrictions to cross-border financial transactions than in an economy that imposes limits to capital flows ($\hat{x} < \tilde{x}$).

A higher interest rate for the alternative investment and a higher probability of avoiding detection also imply a higher critical level of capital below which corruption takes place and above which corruption is absent ($\hat{\Omega} < \tilde{\Omega}$). This means that for a given level of wages the incentive to be corrupt is always greater in an open economy than in a closed economy.

Consider now the case in which $k_t > \tilde{\Omega}$, so condition (12) is violated and corruption is absent in the economy. The government budget constraint will be given by equation (14) and the capital accumulation path will be given by equation (15) but for an open economy:

$$\tilde{k}_{t+1} = \left[\frac{r + f\left(1 + \tilde{R}\right)}{f r}\right]\tilde{s}_t \tag{21}$$

Allowing for the free flow of financial resources means that local citizens and overseas citizens can lend their savings to capital producers domestically and abroad. Since local capital producers immediately adjust to offer lenders the same interest rate that they could obtain overseas, lenders all over the world will be indifferent between investing domestically or abroad. In order to break this knife edge equilibrium we assume that agents facing these equally attractive alternatives will choose to invest locally.[21] Hence in an open economy with no corruption total savings are equal to savings from households, $M\left(l w_t - t_t + q\right)$, plus savings from bureaucrats, $N w_t$. Using (14) for total tax revenue, (2) for wages and $g_t = ag\,k_t$, the total savings in the absence of corruption may be described as:

$$\begin{aligned} \tilde{s}_t &= M l w_t - g_t + Mq \\ &= a\left(a - g\right) k_t + Mq \end{aligned} \tag{22}$$

Notice that (16) and (22) are equal due to our home bias assumption. After replacing (22) into (21) the capital accumulation path for a non-corrupt open economy can be described as:

$$\tilde{k}_{t+1} = \tilde{e}\left[a\left(a - g\right) k_t + Mq\right] \equiv \tilde{f}_{nc}\left(k_t\right) \tag{23}$$

Considering that the amount of bequests is always positive and assuming $\tilde{e}\,a\left(a - g\right) < 1$, the steady state of a non-corrupt financially open economy is

$\tilde{k}_{nc}^{*} = \dfrac{Mq}{1-\tilde{e}\,a(a-g)} > \hat{k}_{nc}^{*}$, given that $\tilde{e} > \hat{e}$. Now consider the case in which $k_t < \tilde{\Omega}$. This means that condition (12) is satisfied and corruption is present in the economy. In this scenario, the government budget constraint is equation (18) but for an open economy:

$$Mt_t = [1-(1-\tilde{p})n]Nw_t + g_t + d + \tilde{p}nN\tilde{x} \tag{24}$$

The capital accumulation path in a corrupt environment is also described by (21). However, total savings in a corrupt open economy are different than total savings in a corrupt closed economy. The difference is that corrupt civil servants are not indifferent between investing locally or abroad in an open economy. In fact, they have the benefit of hiding the proceeds of corruption abroad. Hence, total savings in an open corrupt economy are equal to the amount saved by households $M(lw_t - t_t + q)$, non-corruptible bureaucrats $(1-n)Nw_t$ and the legal income of successful corrupt bureaucrats $\tilde{p}nNw_t$. In a financially open economy corrupt bureaucrats invest their illegal income abroad. We can summarise total savings in an open economy under the presence of corruption as:

$$\begin{aligned} \tilde{s}_t &= Mlw_t - g_t - d - \tilde{p}nN\tilde{x} + Mq \\ &= a(a-g)\,k_t - d - \tilde{p}nN\tilde{x} + Mq \end{aligned} \tag{25}$$

Replacing (25) into (21) we may describe the capital accumulation path of a financially open economy affected by corruption as:

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[21] This assumption is based on the famous home bias puzzle, first reported by French and Poterba (1991). According to this puzzle agents prefer to invest locally even though they

$$\tilde{k}_{t+1} = \tilde{e}\,[a(a-g)\,k_t - d - \tilde{p}nN\tilde{x} + Mq] \equiv \tilde{f}_c(k_t) \qquad (26)$$

Assuming that $Mq > (d + \tilde{p}nN\tilde{x})$ and $\tilde{e}a(a-g) < 1$ as before, the steady state of a corrupt open economy is $\tilde{k}_c^* = \dfrac{Mq - d}{1 - \tilde{e}a(a-g)}$. This value may be greater equal or less than $\hat{k}_c^*$, depending on the size of the positive impact of financial liberalisation on the productivity of capital producers compared with the negative impact in the rise and flight of embezzled public funds.

A complete characterisation of the impact of financial liberalisation is depicted in Figure 2. Notice that $\tilde{f}_{nc}(k_t)$ has a higher slope than $\hat{f}_{nc}(k_t)$, thus capital account liberalisation has an unambiguous positive effect on capital accumulation in a non-corrupt environment. However, in spite of the fact that $\tilde{f}_c(k_t)$ has a higher slope than $\hat{f}_c(k_t)$, concealment of the proceeds of corruption abroad shifts $\tilde{f}_c(k_t)$ downwards. Therefore, in a corrupt scenario, the removal of barriers to capital flows could have either a positive or a negative impact on capital accumulation and growth, depending on the magnitude of this opposite effects. Moreover, taking into account that corruption affects the critical value from which corruption disappears and under which corruption emerges, international financial liberalisation in the model could in principle generate corruption in a nation that was free of this governmental decease.

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can benefit from diversifying their portfolio abroad.

6. Conclusions

This paper is a theoretical contribution to the debate on the benefits and risks of international financial liberalisation. We have offered an alternative explanation for the contrasting experiences of developing countries in this matter. Our analysis demonstrates that corruption cannot be ignored at the moment of evaluating the removal of capital controls.

We have found that corruption leads to lower capital accumulation, and is higher at lower levels of development, in both open and closed economies. Nonetheless, the impact of corruption is definitely stronger in economies that remove the barriers to capital flows.

In accordance with recent empirical evidence our model shows that opening up a non-corrupt economy to cross border financial transactions unambiguously raises capital accumulation and promotes long-run growth. In contrast, opening up a corrupt economy to international capital flows leads to higher corruption and may reduce capital accumulation. This is explained by the fact that on the one hand, international financial liberalisation has a positive effect on the productivity of capital producers and hence on capital accumulation. However, on the other hand, the removal of barriers to cross border financial transactions increases corruption and causes capital flight. This delicate balance of forces working in opposite directions ultimately determines the impact of international financial liberalisation on the capital accumulation path of economies that are trapped in a vicious circle of high corruption and underdevelopment.

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FIGURE 1

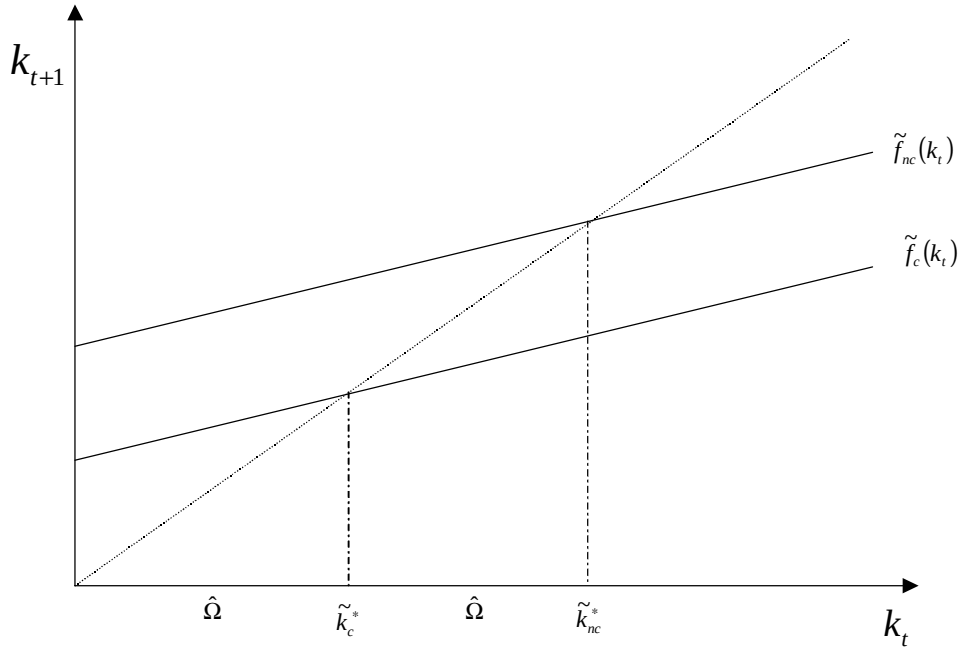

FIGURE 2