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Abstract
The paper develops a theoretical model showing a mutual relationship between corruption and capital account restrictions. According to the model, higher corruption induces stricter restrictions and *vice versa*. We test the model using panel data for 112 countries over the period 1984–2002 and find that corruption and restrictions are indeed mutually determined. Estimating the model simultaneously, capital account restrictions induce higher corruption. Higher corruption, in turn, is associated with more restrictions on the capital account. The empirical relationship is, however, not completely robust.

JEL classification: C33, D19, F33, G11, H26, O17

Keywords: Corruption, capital account restrictions, dynamic panel

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1. Introduction

According to the World Bank (2001), corruption is the "single greatest obstacle to economic and social development"; this holds even for developed countries. The Bank estimates that more than US-$ 1 trillion is paid in bribes each year. Thus, corruption represents one of the major "taxes" on economic agents.[1] Consequently, corruption has won increasing interest in the economics literature.

Capital controls, in turn, are also widespread in the world, mainly outside the Western World. Their major purpose is to reach higher tax revenue and to reduce the danger of financial and bank crises. Their incidence increased mainly after the experiences of economic crises in the 1990th. In this context, some institutions and politicians, mainly in Europe, have proposed to introduce capital controls in the Western World, for instance the Tobin tax, to mitigate the "negative" effects of globalisation.

The relationship between corruption and capital flows has frequently been investigated without, however, providing consistent results. While some studies show that corruption reduces capital imports (Lambsdorff 2002; Drabek, Payne 2001; Smarzynska, Wei 2000; Wei 1999), others do not find any significant correlation (Alesina, Weder 1999; Wheeler, Mody 1992).

One channel by which corruption could affect capital flows is via restrictions on the capital account.[2] As Bai/Wei (2001) argue, more corrupt countries are more likely to impose capital controls because corruption reduces the governments' ability to collect tax revenue. In order to raise revenue, politicians therefore rely on capital controls. According to Edwards (1999), DeLong/Eichengreen (2002), El-Shagi (2005), however, capital controls may breed corruption. If controls exist, individuals try to mitigate the burdens by offering side payments and bribes. As one example, Shleifer/Vishny (1993) show that the imposition of capital controls eases collecting bribes; hence the implementation of such controls induces corruption.[3] Combining the two lines of argumentation, thus, there seems to be a mutual relationship between corruption and capital account restrictions.

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[1] Dreher/Herzfeld (2005) provide a recent survey. See also the information provided by the World Bank (2001).

[2] In light of the "efficient grease hypothesis", corruption can, *per se,* not be considered as "good" or "bad". Wei (1999), however, finds no evidence for the "efficient grease hypothesis"; he notes that corruption even bears additional burdens. According to estimates of Dreher et al. (2004), the losses in per capita GDP due to corruption are substantial. This is especially true in sub-Saharan Africa.

[3] The same is true for implementing "red tape" or big-sized businesses (being in nature for the public less transparent than smaller ones). Saha (2001) presents a principal-agent approach where agents entitled to receive subsidy can pay bribes to officials to reduce "red tape".

We analyze this mutual relationship in a two-period model and provide empirical evidence. The model focuses on a small open economy with a fixed exchange rate. A domestic representative household maximizes utility in period 1 deciding how much to consume and save today. A representative firm produces output using capital of domestic and foreign investors. The domestic government levies capital taxes on domestic and foreign investments. Since foreign investments are more difficult to monitor, they cause tax revenue losses that are fought by capital account restrictions. This capital control may cause the domestic interest rate to dissociate itself from the level of the world market. If it falls short, foreign investors leave the country and the higher returns of foreign investments generate incentives for domestic households to bribe public servants monitoring the capital account restrictions. Corruption, in turn, reduces tax revenues and the government has to strengthen capital controls. Hence, the degree of corruption and the degree of capital controls determine themselves simultaneously.

However, capital flight of foreign investors tends to increase domestic interest rates. Therefore, if the additional capital supply of the domestic household, caused by the controls, is lower than total capital supply of foreigners, the domestic level of interest will be unaffected in our model. Consequently, no incentive for corruption would arise.

The model is extended by examining further determinants of corruption and controls and transformed into an econometric model that we test empirically. We analyze (Granger)-causality and estimate corruption and controls simultaneously. We find that corruption and capital account restrictions are indeed mutually determined. However, the empirical relation between restrictions and corruption is not completely robust.

2. Basic Model

Consider a 2-period model with a small open economy. The society of this economy consists of four types of representative agents: private investors, entrepreneurs, public servants and the government. Our aim is to analyze the relationship between capital account restrictions and corruption. Directly, capital account restrictions only affect capitalists' income. Hence, only capitalists have an incentive to conspire with public servants to circumvent restrictions by paying bribes. (For simplicity we exclude "labor" from the analysis.) As we consider a small domestic economy, the interest rate of the world market, denoted by r, is exogenous. Capital income is taxed.

2.1 The Representative Household: Capital Taxes but no Capital Control

The representative household is endowed with wealth W. The household maximizes utility subject to its budget constraint. The two-period's net present value of wealth is given by W plus the discounted value of the net returns on first period's savings. Depending on time preference, the household decides to consume some part of W in the first period, c_1, and saves the rest, i.e. savings S are given by $S = W - c_1$. The savings are distributed on domestic wealth forms (like bonds), denoted by D, and on foreign wealth forms, denoted by F. In period 2, these savings plus the returns are consumed; second period's consumption is denoted by c_2. We use c_1 as numéraire. The consumption price in period 2 is given by p_2. There is no inflation and thus p_2 is equal to the discount rate.

The household's preferences are represented by utility function $u(c_1, c_2)$. We assume

$$\frac{\partial u(c_1, c_2)}{\partial c_t} > 0, \quad \frac{\partial^2 u(c_1, c_2)}{\partial (c_t)^2} < 0, \qquad t = (1,2)$$

$$\lim_{c_t \to 0} \frac{\partial u(c_1, c_2)}{\partial c_t} \to \infty, \quad \lim_{c_t \to \infty} \frac{\partial u(c_1, c_2)}{\partial c_t} \to 0$$

to ensure a unique interior household's optimum.

We denote the domestic interest rate by r_d. The currency exchange rate in each period t is credibly fixed at level one. Domestic and foreign bonds are perfect substitutes. Let capital be completely mobile between inland and abroad. Therefore, it holds that $r_d = r$. Moreover, independent of where capital returns are earned, tax rate τ has to be paid to the state per unit of capital return.[4] Thus the interest parity remains to hold, despite taxation.

The household's decision problem then is

$$(1) \qquad \max_{\{c_1, c_2, S\}} \; u(c_1, c_2) \quad s.t. \quad W + p_2 \cdot R^\tau \cdot S - S \geq c_1 + p_2 \cdot c_2$$

with R^τ representing the world market net gross return per investment unit, i.e. $R^\tau \equiv 1 + r(1-\tau)$; domestic gross return is denoted by $R_d^\tau \equiv 1 + r_d(1-\tau)$. From the first order condition for S we arrive at $p_2 = 1/R^\tau$. From the conditions for

[4] It is common that all residents of a country have to pay capital income taxes with the sum of all capital returns all over the world being the tax base.

first- and second-period- consumption we derive $\frac{\partial u(\bullet)}{\partial c_1} \Big/ \frac{\partial u(\bullet)}{\partial c_2} = \frac{1}{p_2} = R^{\tau}$. Therefore, the price for consumption in period 2 is determined by the interest rate at the world market and the tax rate. The marginal rate of substitution between c_1 and c_2 in the optimum is equal to R^{τ}, so that the time preference is harmonized with the "exchange rate" between today's and tomorrow's consumption, given by the world capital market.

2.2 The Representative Domestic Firm

The representative firm is owned by the representative household.[5] In the first period, the firm produces the economy's output *y*. In period 2, the firm is closed and the output and the remaining stock of capital is consumed by the owners of the firm. The only input is capital, labeled *K*. The technology is given by production function *F*(*K*). We assume the Inada conditions $\lim_{K\to 0} \frac{\partial F(K)}{\partial K} \to \infty$ and $\lim_{K\to\infty} \frac{\partial F(K)}{\partial K} \to 0$ to hold. There is no depreciation of capital.

The firm finances its capital input by bonds or credit. Simplifying, it has to pay the domestic interest rate r_d independent of the type of financing. At the end of the first period, capital is repaid. Obviously, as long as the domestic interest rate r_d is below the world market's level *r* both domestic and foreign households want to invest solely in the world market (arbitrage equilibrium). We denote capital stemming from the inland by K_d and the foreign capital by K_f. If inland residents, in contrast to foreign investors, are restricted in their possibilities to invest abroad, e.g. if capital controls exist, the domestic interest rate may fall short to the world market level, as we will see below. We obtain the following capital distribution:

$$K(r_d, r) = \begin{cases} K_d(r_d, r) + K_f(r_d, r) & \text{if} \quad r_d = r, \\ K_d(r_d, r) & \text{if} \quad r_d < r \end{cases} \qquad (2)$$

with $K_f(r_d, r)$ being the capital supply of foreigners and $K_d(r_d, r)$ domestic supply of capital, respectively, given world market rate *r* and domestic interest rate r_d. In our model, $K_d(r_d, r)$ corresponds with the domestic savings of the representative household, which we denoted by *D*. Profit maximization is described by:

$$\max_{\{K\}} \quad F(K) - (1 + r_d)K.$$

---

5 Cf. the one-consumer, one-producer economy of chapter 15.C in Mas-Colell et al. (1995).

We obtain the common optimum condition:

(3) $$F'(K) = 1 + r_d = R_d.$$

Hence, irrespective of origin, capital is paid by marginal domestic productivity. Due to perfect competition it holds that $F(K) = (1 + r_d)K$. Therefore, the output fully accrues to the investors. The representative household yields $(1 + r_d)K_d = (1 + r_d)D$ via gross capital returns in period 2 (pre-tax returns).

We assumed the Inada conditions to hold. Hence, domestic investment is initially advantageous. Then, in the course of a rising K, productivity $F'(K)$ declines until $R_d = R$. Given foreign capital K_f, this determines the part of savings invested in the inland. The rest of the savings are invested abroad.

At the end of this section, we provide a specific example. We denote the resulting optimal levels of the decision variables in this no-capital-controls-scenario by $(c_1^{nc}, c_2^{nc}, S^{nc}, D^{nc}, F^{nc}, r_d^{nc})$. The arbitrage equilibrium forces $r_d^{nc} = r$.

2.3 The Domestic Government: Capital Account Restrictions

We now turn to the introduction of capital controls by the government. Capital control programs were and still are widespread (e.g. Asiendu, Lien 2003). In the 1960th, during the system of Bretton Woods, the U.S. government used an interest equalization tax and a foreign credit restrain program to stem U.S. capital outflows. While the former reduced the return on foreign portfolio investments, the latter directly limited the outflow of domestic capital (Branson 1989: 418, 419). Therefore, capital controls can be classified into two categories: direct and indirect controls (Asiendu, Lien 2003: 480). The annual report on the *Exchange Rate and Monetary Arrangements* of the IMF shows that capital controls are especially widespread in Sub-Saharan Africa, and that restrictions have been tightened in East Asia in the aftermath of the Asian Financial Crisis. The most utilized type of control in the 1990th was restrictions on capital account transactions. Hence, we will focus on direct capital controls in our analysis.

The reasons for the establishment of capital controls can be manifold (e.g. Milesi-Ferretti 1998):[6] they may increase the independence of monetary policy and promote foreign currency reserves, limit capital flight and may help to redistribute from capital to labor. Moreover, the difficulty of effective banking regulation creates an argument for capital controls, as a second-best solution to the existence of distorted incentives in the banking system. Additionally, capital controls can be used to protect underdeveloped financial markets from

6 See also Alfaro (2001) for a political economy and Stockman/Hernandez (1988) for a general equilibrium analysis.

foreign competition, and to allow small domestic firms to grow toward the efficient scale that they need to compete in the world market (*infant industry argument*; Neely 1999). Outside times of balance-of-payments crisis, however, the main reason for their existence seems to be tax considerations (Bai, Wei 2001; Bartoli, Drazen 1997).

Especially in developing countries, income taxes flow only weakly, mainly for reasons of missing infrastructure and administration in rural areas. The major part of the tax revenue is therefore collected in "hot spots" like big towns. As material capital incomes flow only to some smaller fraction of the population, and mostly in exactly these hot spots, they are easier to monitor. Capital taxes are therefore a popular instrument to collect taxes.[7] Although capital income abroad is treated just like its domestic counter-part, the government cannot monitor foreign investments as good as domestic investments. Moreover, capital is much more mobile than labor and strict taxation leads to capital flight. Hence, a large part of possible tax revenues are never realized. Therefore, capital controls are introduced to reduce the size of opaque foreign investments, to limit potential capital flight and thereby to increase tax revenue.

Let us denote the average part of the foreign investment that is not reported to the domestic revenue office by σ. We neglect all forms of taxes other than those on capital return. The effective tax base is given by $r_d \cdot D + (1-\sigma) \cdot r \cdot F$. Suppose the government's (planned) expenditures step over the tax revenue, given by $T^{nc} = \tau \cdot r \cdot (D^{nc} + (1-\sigma) \cdot F^{nc})$. The government hence introduces a direct capital account restriction: the level of allowed foreign investment of residents is restricted to $F \leq \overline{F}$.[8,9] The level of this capital account restriction is chosen such that it reduces the tax losses $\tau \cdot \sigma \cdot r \cdot F$ so strong that the tax revenue suffices to finance the planned expenditures, given by E.

However, capital account restrictions may bear corruption, whereby foreign investments of size x, beyond threshold $\overline{F}$, are enabled. Therefore, tax revenues are reduced by $\tau \cdot \sigma \cdot r \cdot x$ via corruption. Burgess/Stern (1993: 765), for instance, state that problems like corruption are of considerable importance in the context of the government's resources. Thus, the government has to take into account this trade-off between capital account restrictions and corruption. Moreover, we have to include the fact that the domestic interest rate

7 For a discussion of taxation issues in developing countries see Burgess/Stern (1993).

8 Bartolini/Drazen (1997) report that real-world controls are typically asymmetric, i.e., they are stricter either on inflows or (more frequently) on outflows, as in our model. Following their approach, we do not distinguish between restrictions on short-term flows and those on long-term flows. However, we distinguish between restrictions on residents and non-residents.

9 Until the 1980th comparable restrictions could be found, for instance, in Italy, New Zealand, and Spain; in the 1970th, such controls were practiced in Uruguay (Bartolini, Drazen 1997: section I). As mentioned, in the 1960th, the U.S.A. also levied direct restraints on capital outflows.

r_d may uncouple from the international rate r, if capital account restrictions exist. We assume that the government observes the current level of x, but it neglects equilibrium effects of its policy. Therefore, the government solves the following objective function in each period for $\overline{F}$:

$$E = \tau \cdot \left(r_d \cdot D + (1-\sigma) \cdot r \cdot (\overline{F} + x) \right). \tag{4}$$

In the period of the introduction of the control, r_d can be substituted by r. However, if we consider a period in which controls already exist, we have to distinguish the two levels. Suppose the domestic representative household has to pay a bribe of size b per unit of illegal foreign investment to the civil servant that monitors the capital control. Then, we can state that $D = W - c_1 - \overline{F} - x(1+b)$. Solving for $\overline{F}$ we arrive at:

$$\overline{F}(x) = \frac{E/\tau - r_d S}{(1-\sigma)r - r_d} - (1+b)x. \tag{5}$$

Due to $R = 1+r$ and $R_d = 1+r_d$ equation (5) is equivalent to:

$$\overline{F}(x) = \frac{E/\tau + (1-R_d)S}{(1-\sigma)R + 1 - R_d} - (1+b)x.$$

Accordingly, we find that $\partial\overline{F}/\partial x = -(1+b) < 0$, i.e., more corruption causes a stricter capital account restriction $F \le \overline{F}$.

Such an approach might describe a government's policy in real world, but it neglects the additional effects on the domestic interest rate, and thus on corruption and savings. A stricter capital control may decrease the domestic interest rate and thus the tax base, which lowers the tax revenue. Hence, such a policy may not be time-consistent. Then, the targeted revenue will not be realized. We call this scenario the *bounded rationality case*.[10] The effects of the policy on the domestic interest rate, however, should be accounted for.[11] Applying the *implicit function theorem* to (13), we know that $\frac{\partial\overline{F}}{\partial x} = -\frac{\partial Z/\partial x}{\partial Z/\partial\overline{F}}$, where

[10] Bounded rationality in the sense of neglecting equilibrium effects have been analyzed broadly in the recent literature, e.g. Beilharz, Gersbach (2004); Drazen (2000), Chapter 10; Gersbach, Schniewind (2001); Romer (2003); Saint-Paul (2000). For the general debate on bounded rationality see Rubinstein (1998) or Sargent (1993).

[11] The government might consider decreasing domestic interest rates as something positive because it generates cheap money and more nominal revenue and lower debt cost by inflation. These considerations are not included in our model.

$Z=\bar{F}+x-\frac{E/\tau-r_d(x)S\left(r_d(x)\right)}{(1-\sigma)r-r_d(x)}=0$. Therefore, we find that $\frac{\partial\bar{F}}{\partial x}=-\frac{1-A\cdot\frac{\partial r_d}{\partial x}}{1-A\cdot\frac{\partial r_d}{\partial\bar{F}}}$, with $A\equiv\frac{[(1-\sigma)r-r_d](S+r_d\frac{\partial S}{\partial r_d})+(E/\tau-r_dS)}{[(1-\sigma)r-r_d]^2}$. It is clear that $\frac{\partial r_d}{\partial x}\geq 0$ and $\frac{\partial r_d}{\partial\bar{F}}\geq 0$. As long as the size of $\frac{\partial r_d}{\partial x}$ and $\frac{\partial r_d}{\partial\bar{F}}$ is not too different, the size of $\frac{\partial\bar{F}}{\partial x}$ is close to –1, and therefore remains negative. The sign of $\frac{\partial\bar{F}}{\partial x}$ will only become positive if the signs of $\frac{\partial r_d}{\partial x}$ and $\frac{\partial r_d}{\partial\bar{F}}$ differ substantially from each other. The effect of $\bar{F}$ and x on the domestic interest rate, however, must be very similar, since a marginal increase of both is equivalent to a decrease of variable K, respectively. Accordingly we state:

Proposition 1*:*
Capital account restrictions become stricter when the level of corruption increases, i.e.:

$$\frac{\partial\bar{F}(x)}{\partial x}<0.$$

2.4 The Representative Household: Capital Account Restrictions

We now turn to the behavior of the household in the scenario with capital controls. We assume that $\bar{F}<F^{nc}$, that is, the control is binding. Foreign investors are not affected, but as soon as R_d falls short to R foreign capital leaves the country. As capital controls destroy complete capital mobility, the interest parity of foreign and domestic interest rate might no longer hold, i.e., the domestic interest rate r_d may dissociate itself from r. Hence we have to allow for differing saving revenues R_d and R.

Furthermore, we now allow for the possibility to circumvent the restriction by bribes. We denote by b the necessary side payment to a public servant to weaken the capital account restriction by one unit.[12] The amount of foreign investment additional to $\bar{F}$, realized by corruption, is labeled x. In this scenario, the investor has to maximize the following Lagrangean:

$$(6)\quad L=u(c_1,c_2)+v\cdot(W+p_2\cdot R_d^{\tau}\cdot D-D+p_2\cdot R^{\tau}\cdot F-F-b\cdot x-c_1-p_2\cdot c_2)$$
$$+\lambda\cdot(\bar{F}+x-F).$$

12 That is, there is complete competition among households, and bribe b is taken as given.

The Kuhn-Tucker conditions are:

(7) $$\frac{\partial L}{\partial c_1} = \frac{\partial u(\cdot)}{\partial c_1} - \nu \leq 0 \quad \wedge \quad \frac{\partial L}{\partial c_1} \cdot c_1 = 0$$

(8) $$\frac{\partial L}{\partial c_2} = \frac{\partial u(\cdot)}{\partial c_2} - p_2 \nu \leq 0 \quad \wedge \quad \frac{\partial L}{\partial c_2} \cdot c_2 = 0$$

(9) $$\frac{\partial L}{\partial D} = \nu \cdot (p_2 \cdot R_d^\tau - 1) \leq 0 \quad \wedge \quad \frac{\partial L}{\partial D} \cdot D = 0$$

(10) $$\frac{\partial L}{\partial F} = \nu \cdot (p_2 \cdot R^\tau - 1) - \lambda \leq 0 \quad \wedge \quad \frac{\partial L}{\partial F} \cdot F = 0$$

(11) $$\frac{\partial L}{\partial \nu} = W + p_2 \cdot R_d^\tau \cdot D - D + p_2 \cdot R^\tau \cdot F - F - b \cdot x - c_1 - p_2 \cdot c_2 \geq 0$$
$$\wedge \quad \frac{\partial L}{\partial \nu} \cdot \nu = 0$$

(12) $$\frac{\partial L}{\partial \lambda} = \overline{F} + x - F \geq 0 \quad \wedge \quad \frac{\partial L}{\partial \lambda} \cdot \lambda = 0$$

(13) $$\frac{\partial L}{\partial x} = -\nu \cdot b + \lambda \geq 0 \quad \wedge \quad \frac{\partial L}{\partial x} \cdot x = 0.$$

We assume c_1, c_2, D, F, λ, and ν to be strictly positive. Note that λ represents the increase in utility caused by a marginal increase of $\overline{F}$, that is, when the restriction is weakened by one unit. From (7) we know that ν is the marginal utility of c_1. Hence, fraction λ / ν represents the shadow price for an increase of $\overline{F}$ in terms of the numéraire c_1. Due to $D > 0$, we obtain that discount rate p_2 is equal to $1/R_d$ (see condition (9)). Then, the marginal willingness to pay for corruption in terms of c_1 equals $\frac{\lambda}{\nu} = \frac{R - R_d}{R_d} = \frac{r - r_d}{1 + r_d}$ (via condition (10)).

Condition (13) tells us that as long as this marginal willingness to pay for circumventing the restriction, λ / ν, is higher than bribe b, corruption will occur, i.e. $x \geq 0$. Combining our results, we arrive at $b = \frac{\lambda}{\nu} = \frac{R - R_d}{R_d}$. Notice that arbitrage still forces $R - R_d \geq 0$. The higher the resulting return differential between inland and abroad will be, the higher the willingness to pay bribes. It is clear that we have $F = \overline{F} + x < F^{lf}$ (see condition (12)). Therefore, we know that $D = W - c_1 - \overline{F} - x \cdot (1 + b)$.

We denote the resulting allocation in this capital control scenario by $(c_1^{cc}, c_2^{cc}, S^{cc}, D^{cc}, \overline{F}+x^{cc}, R_d^{cc})$. *Ex ante*, it is not obvious whether D will decline or increase compared to D^{lf}. On the one hand, savings should fall, since average interest revenues decline, so that $S^{cc} < S^{lf}$ and $c_1^{cc} > c_1^{lf}$. As foreign investment may also decline, however, $D^{cc} = S^{cc} - \overline{F} - x^{cc}(1+b)$ can decline as well as grow.

The outcome depends on the reaction of R_d, and thus on the level of corruption given by $x^{cc} = \frac{W - c_1^{cc} - D^{cc} - \overline{F}}{1+b}$, which is determined by $\frac{R - R_d(x^{cc})}{R_d(x^{cc})} = b$. The magnitude of corruption is determined by the interaction of domestic investors and public servants. This issue is analyzed in the following subsection.

Before we describe the interaction of corrupt public servants and domestic investors, we state under which conditions this interaction will occur. First, note that $K_f = 0$ as long as $r_d^{cc} < r$. Given diminishing marginal productivity of capital, $r_d^{cc} < r$ is equivalent to $K^{lf} < K^{cc}$. Thus, we state:

Proposition 2:
In a capital importing economy, capital control $\overline{F}$ will only generate corruption if the size of capital imports, K_f^{lf}, is smaller than the positive effect of the capital control on the capital supply of residents. The critical threshold, denoted by $\widehat{K}_f^{lf}$, is given by $F^{lf} - \overline{F} - x^{cc}$.

The proof is given in the appendix. The intuition goes as follows. The capital control channels domestic capital from abroad to the inland and increases the supply of capital there. This tends to drop the domestic return on capital. The arbitrage equilibrium, however, forces that foreign capital leaves the country to compensate for the excess supply. If the generated excess supply of domestic capital is higher than $\widehat{K}_f^{lf}$ this compensation becomes impossible: the domestic interest rate falls and the offshore rate of return exceeds the onshore rate of return. Contrary, if the net effect of the capital control on the domestic capital market is weak relative to the size of capital imports K_f^{lf} the additional capital supply at the domestic market can be compensated by a partial capital flight of foreigners. The domestic interest rate remains at the world level r, the willingness to pay bribes thereby remains at zero and no corruption arises.

2.5 The Representative Domestic Public Servant[13]

The established capital restriction $F \leq \overline{F}$ requires monitoring by officials. These public agents may be willing and are in a position to weaken the capital account restriction if paid for. In the previous subsection, we derived the investor's willingness to pay for circumventing the capital account restriction. This was given by the discounted value of the differential between foreign return on investment R and domestic return on investment R_d.

Monitoring the behavior of the public servants is costly. Given the government's effort to prevent corruption, public servants are subject to investigation by some official authority with a particular probability. Let the probability of being detected, that a corruptive public servant faces, be p. For simplicity, this probability is constant for all levels of x. The costs a public servant has to expect when corruption is proved increases proportionally in the level of corruption x, and is given by $P \cdot x$, where P is the constant penalty value per proved unit x.[14] We assume that the public servants know the investor's willingness to pay, for all levels of x. In the following, we denote the willingness to pay by $B(x)$, given by $[R - R_d(x)] / R_d(x)$. It represents the inverse demand function for corruption.[15]

R_d is determined by the interaction of the capital supply by investors and the capital demand by domestic entrepreneurs. The lower restriction $\overline{F}$, the higher is the domestic supply of capital. All other things equal, R_d therefore tends to decline with $\overline{F}$. Furthermore, if x increases, the capital supply at the domestic capital market will, *ceteris paribus*, decline; as higher corruption levels allow for higher foreign investment, the marginal willingness to pay bribes declines in the level of corruption x. Therefore, public servants face an inverse corruption demand curve with a negative slope concerning corruption level x (in section 2.6, we explicitly derive the negative slope of $B(x)$ for a specific example). Thus, the more corrupt they are, the lower the bribe per unit x they obtain; that is, the lower bribe b.

Given this inverse demand function of the domestic investor, the officials can act like oligopolists and maximize their expected revenue. For simplicity, we consider a single public servant who acts like a monopolist. The decision problem of the representative public servant is described by:

$$\max_{\{x\}} (1-p) \cdot B(x, \overline{F}) \cdot x - p \cdot P \cdot x.$$

We obtain an *Amoroso-Robinson* relation:

$$(1-p) \cdot B(x, \overline{F}) \cdot (\eta_{B,x} + 1) = p \cdot P \qquad (14)$$

---

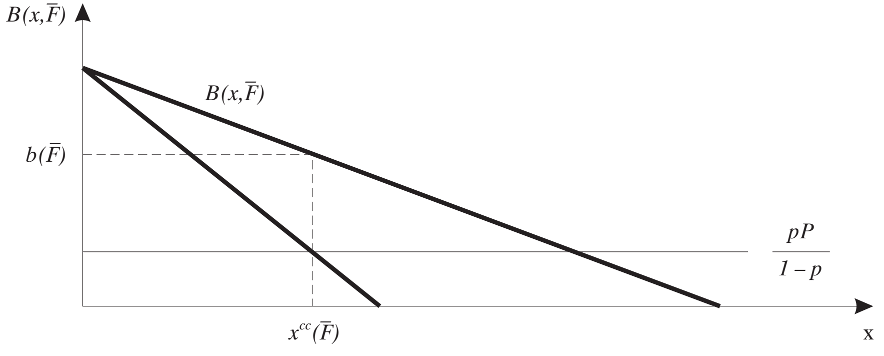
13 The analysis roots in Shleifer/Vishny (1993). It is also broadly related to the tax evasion literature (e.g. Allingham, Sandmo 1972; Srinivasan 1973).

14 The penalty can be salary shortenings up to dismissal, fines or even imprisonment, but also a loss of reputation. In practice, of course, these penalty outcomes are uncertain. There are also some fixed costs for hushing up the crime, but these fixed costs are negligible.

15 The type of corruption we analyze can be classified as "corruption with theft" (following Shleifer, Vishny 1993) or as "collusive corruption" (following Bardhan 1997: 1334).

Figure 1

Determination of the Level of Corruption x^{cc} for a Given Level of Capital Control $\bar{F}$



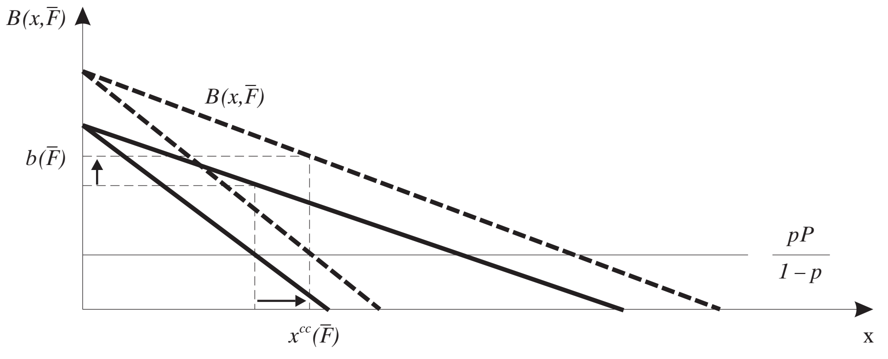
with $\eta_{B,x}$ being the inverse demand-elasticity $\frac{\partial B(x,\bar{F})}{\partial x}\cdot\frac{x}{B}<0$. This condition determines the endogenous level of corruption x^{cc} in the economy, given a particular level of binding capital account restriction $\bar{F}$. The decision problem is illustrated in Figure 1.

If the capital control becomes stricter, the marginal willingness to pay bribes will increase. In Figure 1, this means that the willingness to pay curve $B(x,\bar{F})$ shifts outwards so that the intersection point of the marginal revenue curve $B(x,\bar{F})+B'(x,\bar{F})\cdot x$ and the marginal cost curve $p\cdot P/(1-p)$ moves to the right. Hence, as long as the capital restriction is binding, the level of corruption decreases with the level of $\bar{F}$, that is, $x^{cc}=x^{cc}(\bar{F})$ with $\frac{\partial x^{cc}(\bar{F})}{\partial\bar{F}}<0$. This is depicted in Figure 2. Note that the burden of bribes paid by the domestic investor, $b\cdot x$, definitely increases when the control is stricter.

If there are several public servants competing with each other, the individual elasticity η will decline; in the extreme, with perfect competition among multiple officials, the elasticity tends to zero and the expected bribe per unit equals the "expected unit costs". Then, the bribe is low and corruption widespread. In contrast, the bribes are the highest and the extent of corruption lowest if there is only one single monopolistic public servant.[16]

16 Cf. Shleifer/Vishny (1993) for a similar industrial organization debate of corruption. See also Andvig/Moene (1990); Cadot (1987).

Figure 2
The Effect of a Stricter Capital Control on Corruption and Bribe



2.6 A Specific Example

In order to provide a specific example, we use a Cobb-Douglas utility function:

(15) $$u(c_1, c_2) = (c_1)^{\alpha} \cdot (c_2)^{\beta}.$$

Maximizing (15) subject to $W + P_2 R^{\tau} S - S = c_1 + \frac{c_2}{R}$, and assuming an interior solution, we find:

(16) $$c_1^{nc} = \frac{\alpha}{\alpha+\beta} \cdot W$$

(17) $$c_2^{nc} = \frac{\beta}{\alpha+\beta} \cdot R^{\tau} \cdot W$$

(18) $$S^{nc} = \frac{\beta}{\alpha+\beta} \cdot W.$$

We consider the following specific production function:

$$F(K) = \begin{cases} 0 & \text{if} \quad K \leq 1 \\ \ln K & \text{else} \end{cases}.$$

Let us assume that $K \geq 1$. Applying $K = D + K_f$ and the domestic capital equilibrium condition in (3), we obtain:

(19) $$D^{nc} = \frac{1}{R} - K_f^{nc}.$$

Finally, $F^{nc} = S^{nc} - D^{nc}$ so that

$$F^{nc} = \frac{\beta}{\alpha+\beta} \cdot W + K_f^{nc} - \frac{1}{R}. \tag{20}$$

Due to identical rates of return between home and foreign investment, the distribution between D^{nc} and F^{nc}, and thus between D^{nc} and K_f^{nc}, is indeterminate in our setting. However, if $K_f^{nc} = 0$ the maximum level of D^{nc} is $1/R$ and the minimum level of F^{nc} is $\frac{\beta \cdot W}{\alpha+\beta} - \frac{1}{R}$. Similarly, if K_f^{nc} is at its maximum, i.e. at $1/R$, then $D^{nc} = 0$ and $F^{nc} = \frac{\beta \cdot W}{\alpha+\beta} = S^{nc}$.

We now turn to the case with a control on foreign investment of residents. Substituting (15) into (6) and applying conditions (7) to (13), one arrives at:

$$c_1^{cc} = \frac{\alpha[R_d^\tau W + (R^\tau - R_d^\tau)\overline{F}]}{(\alpha+\beta)R_d^\tau} \tag{21}$$

$$c_2^{cc} = \frac{\beta[R_d^\tau W + (R^\tau - R_d^\tau)\overline{F}]}{(\alpha+\beta)} \tag{22}$$

$$S^{cc} = \frac{\beta \cdot R_d^\tau \cdot W - \alpha(R^\tau - R_d^\tau)}{(\alpha+\beta)R_d^\tau} \tag{23}$$

$$D^{cc} = \frac{\beta \cdot R_d^\tau \cdot W - (\alpha \cdot R^\tau + \beta \cdot R_d^\tau)\overline{F}}{(\alpha+\beta)R_d^\tau} - x^{cc} \tag{24}$$

$$F^{cc} = \overline{F} + x^{cc}. \tag{25}$$

If we apply the specific production function, the firm's demand for capital on the domestic market is given by $K^D(R_d) = 1/R_d$. A capital market equilibrium requires the following condition to hold: $1/R_d = D^{cc}(R_d^\tau) + K_f^{cc}$. Therefore, the equilibrium level of the domestic interest rate as a function of the level of corruption x^{cc} is implicitly given by:

$$R_d(x^{cc}, \overline{F}) = \frac{\alpha+\beta}{(a+\beta)(K_f^{cc} - x^{cc}) + \beta(W - \overline{F}) - \alpha \frac{R^\tau}{R_d^\tau} \overline{F}}. \tag{26}$$

One can calculate that $R_d(x^{cc},\overline{F})=R$, respectively $R_d^\tau = R^\tau$, if the level of investments of foreigners equals $\hat{K}_f^{cc} = \overline{F} + x^{cc} + 1/R - \beta \cdot W/(\alpha+\beta)$. Due to arbitrage we have $K_f^{cc} = \hat{K}_f^{cc}$ as long as $\hat{K}_f^{cc} \geq 0$. However, for all capital controls $\overline{F}$ stricter (lower) than $\frac{\beta \cdot W}{\alpha+\beta} - x^{cc} - \frac{1}{R}$ the required capital supply of foreigners is negative, that is, $R_d < R$. Hence, only in cases when this condition is fulfilled there is an incentive to bribe civil servants. In the following we assume that corruption exists, that is, $K_f^{cc} = 0$ and $R_d < R$.

Using $R_d^\tau = 1 + r_d(1-\tau)$ equation (26) can be rearranged to:

$$Z \equiv 1 + r_d - \frac{\alpha+\beta}{\beta(W-\overline{F}) - (\alpha+\beta)x^{cc} - \frac{\alpha R^\tau \overline{F}}{1+r_d(1-\tau)}}.$$

One can calculate that:

$$\frac{\partial Z}{\partial \overline{F}} = -\frac{(\alpha+\beta)\left(\beta + \alpha\frac{R^\tau}{R_d^\tau}\right)}{\left(\beta(W-\overline{F}) - (\alpha+\beta)x^{cc} - \frac{\alpha R^\tau \overline{F}}{1+r_d(1-\tau)}\right)^2} < 0$$

$$\frac{\partial Z}{\partial r_d} = 1 + \frac{\alpha(\alpha+\beta)(1-\tau)\frac{R^\tau}{(R_d^\tau)^2}\overline{F}}{\left(\beta(W-\overline{F}) - (\alpha+\beta)x^{cc} - \frac{\alpha R^\tau \overline{F}}{1+r_d(1-\tau)}\right)^2} < 0$$

$$\frac{\partial Z}{\partial x^{cc}} = -\left(\frac{\alpha+\beta}{\beta(W-\overline{F}) - (\alpha+\beta)x^{cc} - \frac{\alpha R^\tau \overline{F}}{1+r_d(1-\tau)}}\right)^2 < 0.$$

The *implicit function theorem* says that $\frac{\partial r_d}{\partial \overline{F}} = -\frac{\partial Z/\partial \overline{F}}{\partial Z/\partial r_d} = -\frac{(<0)}{(>0)} > 0$, that is, the interest rate diminishes if the capital account restriction becomes stricter. The willingness to pay for one additional unit of foreign investment is given by:

(27)
$$B(x^{cc},\overline{F})=\frac{R^{\tau}}{R_d^{\tau}(x^{cc},\overline{F})}-1.$$

Therefore, the willingness to pay for corruption increases if the restriction becomes stricter. Furthermore, the implicit function theorem says that $\frac{\partial r_d}{\partial x^{cc}}=-\frac{\partial Z/\partial x^{cc}}{\partial Z/\partial r_d}=-\frac{(<0)}{(>0)}>0$. This means that the willingness to pay for corruption decreases with the size of corruption x. Hence, the public servant faces a negative sloped willingness to pay function, as we have assumed in Figures 1 and 2. The public servant chooses the optimal combination of bribe and corruption by:

(28)
$$\max_{\{x^{cc}\}}(1-p)\left\{\frac{R^{\tau}}{R_d^{\tau}(x^{cc},\overline{F})}-1\right\}x^{cc}-pPx^{cc}.$$

It is easy to prove that our results imply $\frac{\partial B(x,\overline{F})}{\partial x}=-\frac{R^{\tau}}{(R_d^{\tau})^2}\cdot\frac{\partial R_d^{\tau}}{\partial x}<0$ and $\frac{\partial B(x,\overline{F})}{\partial \overline{F}}=-\frac{R^{\tau}}{(R_d^{\tau})^2}\cdot\frac{\partial R_d^{\tau}}{\partial \overline{F}}<0$. Applying equation (14), the public servant's optimal decision is based on the following condition:

$$B(x,\overline{F})+\frac{\partial B(x,\overline{F})}{\partial x}\cdot x=\frac{p}{1-p}\cdot P.$$

If the government sets the restriction more strictly, the left-hand-side of this equation increases. Consequently, for the equation to hold, the level of corruption x has to rise in equilibrium. Thus our analysis in section 2.5, concerning Figures 1 and 2, is supported and we state:

Proposition 3:
The equilibrium level of corruption will increase if capital controls become stricter, i.e.:

$$\frac{\partial x^{cc}(\overline{F})}{\partial \overline{F}}<0.$$

Summarizing, the introduction or tightening of capital account restrictions lowers the domestic interest rate, so that it falls short from the world market level. It follows that the marginal willingness to pay bribes, given by $\frac{\lambda}{\nu}=\frac{R^{\tau}-R_d^{\tau}}{R_d^{\tau}}=\frac{(r-r_d)(1-\tau)}{1+r_d(1-\tau)}$, is strictly positive. Finally, paying bribes to circumvent the restriction lowers the interest spread between inland and abroad.

2.7 Corruption and Capital Account Restriction in Equilibrium

So far we have demonstrated how investors react on capital account restrictions and how a government reacts on corruption, respectively. The agents interact strategically. The interaction between civil servant and domestic household is a simple game between a monopolistic civil servant and many investors in perfect competition, like we have described it above. In contrast, the strategic interaction between the investors and the government is more demanding. The interaction is best described by a sequential game in which the government is a dominant agent that moves first. Our representative, domestic investor is a reacting second mover. Hence, one has to apply the model of von Stackelberg (1934).

Solving the game by backward-induction, the government anticipates the domestic investor's reaction, given by the solution of problem (28). At this point, we have to distinguish two cases: bounded rationality and unbounded rationality of the government. It is plausible to assume that a government neglects the equilibrium effect of its capital control policy on interest rate r_d. If this is the case the government is bounded rational. Then, the government solves objective function

$$E = \tau \left[r_d \cdot D^{cc}\left(x(\overline{F})\right) + (1-\sigma) \cdot r \cdot \left(\overline{F} + x(\overline{F})\right)\right]$$

for $\overline{F}$, given equation (24) and the solution of (28). If we denote the equilibrium level by $\overline{F}^*$, the corresponding level of corruption in equilibrium can be found by substituting $\overline{F}^*$ into the solution of problem (28). Unfortunately, we cannot solve the game analytically, because we are only able to derive an implicit solution for the equilibrium rate of interest.

Summarizing, we have demonstrated that the installation of capital controls may generate incentives for corruption. The stricter the controls, the stronger corruption will be. Moreover, the model suggests that stronger corruption will induce stricter capital controls. Hence, it predicts a mutual relationship:[17] capital account restrictions and corruption reinforce each other.

Our model is simple and partial. For instance, we narrow capital controls on restricting foreign investment and the analysis is confined to a portfolio decision. However, capital controls mainly affect investment decisions and aim on

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17 We analyzed restrictions on capital outflows. Of course, a similar exercise is possible for capital imports. In this case, domestic investors would benefit from restrictions on domestic investments of foreigners, since the domestic interest rate would rise. If capitalists are politically strong, the government might establish such capital controls; this could also reduce the dependence from abroad and weaken foreign competitors on product markets. The rise of the domestic interest rate will bear incentives for foreigners to bribe public servants. The government's trade-off in establishing capital controls lies in the fact that the increased interest rate represents higher domestic costs and corruption.

capital outflows. Thus the model is adequate to highlight an important channel as to how capital controls and corruption may interact. In the following, we empirically test whether the effects identified in Proposition 1 and 3 are confirmed by the data. Proposition 2 does not lend itself to measurement.

3. Empirical Estimation of the Relationship between Corruption and Capital Account Restrictions

To measure corruption, we employ an index provided by the *International Country Risk Guide*. This indicator is based on the analysis of a world-wide network of experts. It is well suited to test the predictions of our model.[18]

Our indicator of capital account restrictions is constructed with binary data from the International Monetary Fund's annual report *Exchange Arrangements and Exchange Restrictions*. The IMF data are the most widely used measures of capital controls and allows an almost universal coverage of countries. We focus on four forms of restrictions:

- restrictions on payments for capital account transactions,
- separate exchange rate(s) for some or all capital transactions and/or some or all invisibles,
- surrender requirements for proceeds from exports and/or invisible transaction and
- restrictions for payments on current transactions.

While the first three restrictions can broadly be interpreted as a form of controls on capital, the fourth restriction has been included because current transactions can be used to circumvent restrictions on the capital account (Milesi-Ferretti 1998: 225).[19]

Our index of restrictions aggregates the four measures. Therefore, the index takes the value of 4 for fully restricted capital accounts, and 0, if no restrictions are in place.[20] As an obvious shortcoming with this approach, our index does neither measure the intensity nor the effectiveness of controls. One would also like to distinguish between controls on inflows of capital and those on out-

18 Note that the focus of this index is on capturing political risk involved in corruption. Since it is the only perception-based data on corruption providing consistent time series, the index has nevertheless been widely used in empirical studies.

19 In 1997 the IMF changed the format of its survey. Following Glick/Hutchison (2005) we coded "restrictions on payments for capital account transactions" to be unity if controls were in place in 5 or more of the sub-categories of capital account restrictions, and "financial credit" was one of the categories restricted.

20 A similar procedure has been employed, e.g., by Gruben/McLeod (2001) and Bai/Wei (2001).

flows. We do, however, neither have the data to adequately control for intensity and effectiveness,[21] nor those for an analysis of inflows and outflows.

To assess the relationship between corruption and capital account restrictions empirically, we use a panel of 112 countries. Our data cover the years 1984–2002. We employ averages over three years for all variables. This makes the indices of corruption and capital account restrictions continuous with values ranging between 0 (no corruption) and 6 (high corruption) and, respectively, 0 (not restricted) and 4 (fully restricted). By making the dependent variables less discrete, we can use linear estimation methods. Some of the data are not available for all countries or every year. Therefore, our panel data are unbalanced and the number of observations depends on the choice of explanatory variables. All variables, their precise definitions and data sources are listed in the appendix.

3.1 Determinants of Corruption

Table 1 shows the estimates of the effect of capital account restrictions on corruption. Estimation is by OLS. To account for time-invariant unobservable heterogeneity potentially correlated with the regressor, we use a fixed effects specification. Therefore, we could not include variables that do not change over time. We also tested for fixed time effects but found them to be insignificant.

Column (1) contains results from a regression of the index of corruption on the index of capital account restrictions. As can be seen, without the relevant control variables, the coefficient is completely insignificant. In the further columns of Table 1, we add control variables to account for time-varying observable heterogeneity. Following Lederman et al. (2001), we test for the influence of four groups of control variables.

First, corruption is probably influenced by the political system. We include an index of democracy and an index for the competitiveness of nominating candidates for the legislature to proxy the degree of political competition. We hypothesize corruption to be lower in more democratic and more competitive countries. Indices measuring legislature fractionalization of the government and, respectively, the opposition are also included. We expect corruption to be lower when the government consists of more parties. The effect of a fractionalized opposition is less clear. On the one hand, high fractionalization could proxy high competition. On the other hand, it could indicate weak opposition.

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21 To proxy the intensity or effectiveness of capital controls, black market premiums, onshore-offshore interest differentials and deviations from covered interest parity have been employed (e.g. Giavazzi, Pagano 1988; Dooley, Isard 1980). However, those variables measure other aspects as well. We focus on the existence rather than the degree of controls and do not use them.

Table 1

Determinants of Corruption
panel data, 112 countries, 1984–2002

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Capital account restrictions	0.008 (0.24)	0.093 (2.32**)	0.030 (0.81)	–0.007 (–0.17)	0.092 (2.12**)	0.095 (2.21**)
Index of democracy		–0.081 (–2.98*)	–0.072 (–3.69*)	–0.074 (–3.58*)	–0.053 (–2.69*)	–0.058 (–3.04*)
Competitive nomination		–0.009 (–0.05)				
Government fractionalization		0.157 (0.75)				
Opposition fractionalization		0.289 (1.61)				
Free press		0.006 (2.66*)	0.002 (1.02)	0.004 (2.07)	0.001 (0.62)	0.001 (0.59)
Fixed exchange rate (dummy)		–0.061 (–0.56)				
Share of protestants			0.084 (1.47)			
Government revenue (as a share of GDP)				–0.009 (–1.07)		
Openness				0.002 (0.71)		
ln(gdp per capita)					0.069 (0.30)	
Illiteracy rate (% of people ages 15 and above)					0.016 (1.93[a])	0.013 (1.69[a])
Number of observations	716	411	513	471	444	449
R^2	0.131	0.409	0.162	0.380	0.139	0.157

The coefficients of the country dummies are not reported. – t-statistics in parentheses: *Significant at the 1 percent level. – **Significant at the 5 percent level. – [a]Significant at the 10 percent level. All variables are averages over three years.

Since transparency increases the accountability of politicians, an index for the freedom of the press is included. We also add a dummy which takes the value of one if the IMF classifies the exchange rate of the respective country as fixed, and zero otherwise.

Second, corruption is likely to depend on cultural factors. Variables related to regional, ethnical and religious characteristics of a country might be important. Since most of those variables do, however, not vary over time, we can not include them in a fixed effects specification. Our country dummies account for them. Therefore, the only variable we employ is the share of Protestants in the population which shows some variation over time.

Third, variables measuring governments' policies are employed. Total government revenue as a share of GDP is used to quantify the size of the government and therefore the size of the rents available for extraction. Corruption has been shown to decrease with economic openness (Ades, di Tella 1994). We therefore include a country's exports and imports relative to GDP.

Fourth, we include variables to account for the degree of development. We expect corruption to be lower in countries with a higher GDP per capita and lower rates of illiteracy.

The groups of variables are included one at a time in addition to the variables that are significant at the ten percent level at least. Column (2) adds the political variables, while the cultural variable is included in column (3). Columns (4) and (5) include the variables accounting for policy and development, respectively. Finally, column (6) combines all previously significant variables.

As can be seen, most of our covariates are insignificant. The exceptions are democracy, freedom of the press, and the illiteracy rate. It turns out that democracy and a free press reduce corruption at the one percent level in the regression of column (2). In the final equation of column (6), only democracy, however, keeps its significant coefficient. At the ten percent level, illiteracy increases corruption.

Turning to the results for capital account restrictions, the table shows that the significance of the coefficient depends on the specification of the regression. In the final equation of column (6), the coefficient is significant at the five percent level, with the expected positive sign. The coefficient is quantitatively relevant. A reduction in the intensity of controls by one point (i.e. the abolition of one restriction) leads to a decrease in corruption by 0.1 points. This has been, e.g., the difference in the index of corruption between Australia and Switzerland, or between Austria and Portugal over the period 1999–2002.

3.2 Determinants of Capital Account Restrictions

Table 2 uses the index of capital account restrictions as dependent variable. Again, our focus is on the relation between restrictions and corruption. We tested for fixed time and country effects and found them to be significant.

Column (1) shows the result of the regression of the index of restrictions on the index of corruption. However, its coefficient is not significant at conventional levels.

As covariates, we employ variables usually included in regressions trying to explain restrictions on the capital account. We focus on three groups of variables. The first group contains variables accounting for the political system, and political as well as economic crises. We include a variable measuring the degree of democracy. The median voter is probably supportive of capital account restrictions. On the other hand, authoritarian leaders tend to support the interests of inward looking sectors (Brune et al. 2001). The influence of de-

Table 2

Determinants of Capital Account Restrictions
panel data, 112 countries, 1984–2002

Explanatory variables	(1)	(2)	(3)	(4)	(5)
Corruption	0.005 (0.10)	0.099 (1.6[a])	0.088 (1.6[a])	0.132 (2.29**)	0.129 (2.24**)
Index of democracy		0.014 (0.64)			
Socialist governments		0.256 (2.03**)	0.150 (1.30)	0.051 (0.36)	0.073 (0.52)
Political instability		–0.167 (–1.40)			
Banking crises		0.220 (2.00**)	0.187 (1.87[a])	0.177 (1.55)	0.165 (1.46)
Currency crises		0.213 (1.38)			
ln(gdp per capita)			0.507 (1.98**)	0.612 (2.05**)	0.775 (2.81*)
ln(population)			2.044 (3.60*)	1.529 (2.04**)	1.759 (2.43**)
Monetary growth				0.0001 (2.29**)	0.0001 (2.30**)
GDP growth				–0.024 (–1.98**)	–0.024 (–2.08**)
Openness				0.002 (0.54)	
Gross domestic savings				0.012 (1.33)	
Number of observations	716	438	509	422	422
R^2	0.154	0.406	0.387	0.373	0.368

The coefficients of the country and time dummies are not reported. – t-statistics in parentheses: *Significant at the 1 percent level. – **Significant at the 5 percent level. – [a]Significant at the 10 percent level. All variables are averages over three years.

mocracy on restrictions is thus not obvious *a priori*. We also include a dummy which is one if a country's government is left-wing and zero otherwise. Since left-wing governments are traditionally closer to labor, we expect them to restrict the capital account more frequently than more conservative governments do.

In order to prevent capital flight, unstable governments are also likely to impose more restrictions (Milesi-Ferretti 1998: 230). We thus include an index of political stability (Dreher 2005).[22] Capital controls are also frequently introduced during banking or currency crises. We therefore include variables accounting for those crises.[23]

[22] The index is constructed using principal components analysis. It employs the following categories: assassinations, strikes, guerrilla warfare, government crisis, riots and revolutions. Since those variables are highly collinear, they should not be included all separately in one regression.

[23] Cukierman et al. (1992) suggested the turnover rate of central bankers to measure the central bank's degree of independence. With independent central banks, governments have no influence

We also include variables measuring the degree of development suggested by Brune et al. (2001). We expect the capital account to be less restricted with higher GDP per capita. This is because higher per capita GDP is usually associated with better developed financial institutions. Those countries are, in turn, more likely to reap benefits from open capital accounts. The natural logarithm of a country's population is included to control for its size. Smaller countries derive more benefits from integration and are therefore more likely to have open capital accounts.

Moreover, capital account restrictions might be affected by economic variables. We expect a country's capital account to be more restricted, the higher its rate of monetary expansion. This is because capital flight is more attractive with higher money growth, since the interest rates tend to diminish. Countries with lower rates of economic growth might feel the need to liberalize in order to attract foreign capital. The influence of a country's openness is, *a priori*, not obvious (Milesi-Ferretti 1998). On the one hand, countries with a large trade balance (relative to GDP) are more heavily exposed to external shocks which provide incentives to impose restriction on capital flows.[24] On the other hand, it is more difficult to monitor capital flows in open economies. Countries with low domestic savings require more foreign capital. They are therefore less likely to restrict capital flows.

In column (2), we include our political variables. It turns out that more socialist governments tend to introduce or maintain restrictions on the capital account significantly more frequently. Restrictions are also significantly more likely at the time of banking crises. The index of corruption is now significant at the ten percent level and has the expected sign. Capital account restrictions are not influenced by democracy, currency crises and political instability.

In addition to the significant covariates, columns (3) and (4) include variables accounting for a country's level of development and, respectively, government policies. Higher per capita GDP, a greater population, higher monetary growth and less GDP growth lead to more restrictions, while openness to trade and gross domestic savings have no effect. The index of corruption is significant at the ten and five percent level, respectively, with the expected sign.

Finally, in column (5), we combine all variables which have been significant in one of the previous regressions. While most of the results remain, left-wing governments and banking crises no longer influence restrictions. The index of corruption is again significant at the five percent level. Its coefficient shows

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on monetary policy which reduces incentives to implement capital account restrictions. We do not include this variable because it reduces our number of observations substantially.

24 For instance, capital flows may destabilize an economy by increasing the risk of widespread bank failures.

that an increase in corruption by one point leads to 0.13 points more restrictions on the capital account.

To sum up, there is evidence that corruption and capital account restrictions are correlated. If we assume restrictions to be exogenous determinants of corruption, the results show that restrictions increase corruption. Similarly, if taken as exogenous, corruption leads to more restrictions on the capital account. However, if our model is correct, assuming corruption and restrictions to be exogenous determinants of each other is flawed (and estimation by OLS is biased and inconsistent). This objection is supported by our empirical results. We therefore proceed with determining (Granger-)causality between the two variables.

3.3 (Granger-)Causality and Joint Determination of Corruption and Capital Account Restrictions

The analysis has shown that capital account restrictions significantly affect corruption while, in turn, restrictions are significantly influenced by corruption. If there is, however, a mutual relationship like the one predicted by our model, the ordinary least squares technique applied above yields inconsistent estimates of the parameters and our equations had to be estimated simultaneously. To determine the direction of the causal relationship we use a dynamic model. Causality is defined in the sense of Granger (1969). That means that a variable *x* is causing a variable *y* if past values of *x* help to explain *y*, once the past influence of *y* has been accounted for.

If we have *N* cross-sectional units observed over T time periods, the model is:

$$y_{i,t} = \sum_{j=1}^{m} \alpha_j y_{i,t-j} + \sum_{j=1}^{m} \beta_j x_{i,t-j} + \alpha_i + u_{i,t}, \tag{32}$$

where $i = 1, \ldots, N$ and $t = 1, \ldots, T$. The parameters are denoted α_j and β_j, the maximal lag length is m, α_i represents unobserved individual effects and u_{it} is an independently and identically distributed stochastic error.

Since the regressions include lagged dependent variables and individual effects, estimation with OLS generates biased coefficients. Moreover, in a short panel the within groups estimator is inconsistent in the presence of endogenous variables (Nickell 1981). We therefore apply the GMM estimator of Arellano/Bond (1991). This estimator consists in first-differencing the estimating equation and using lags of the dependent variable from at least two periods earlier as well as lags of the right-hand side variables as instruments. Since there are more instruments than right-hand side variables, the equations are over-identified and instruments must be weighted in an appropriate way. We only present results from the Arellano-Bond one-step GMM estimator, which uses the identity matrix as a weighting matrix. The two-step GMM esti-

Table 3

Causality tests on Corruption and Capital Account Restrictions
panel data, 105 countries, 1984–2002

	Corruption				Restrictions		
Restrictions				Corruption			
t–1	–0.41*	0.23	–0.07	t–1	0.31*	0.11	0.09
t–2		–0.89**	–0.10	t–2		0.09	0.06
t–3			0.15	t–3			0.15
Corruption				Restrictions			
t–1	–1.02*	–0.92*	–0.95*	t–1	–0.65*	–0.76*	–0.65*
t–2		0.31*	0.26**	t–2		0.17**	0.16**
t–3			–0.31**	t–3			–0.12
p-value for (joint) significance of							
restrictions	0.00	0.03	0.41		0.00	0.00	0.00
corruption	0.00	0.00	0.00		0.00	0.09	0.13

t-statistics in parentheses: *Significant at the 1 percent level. – **Significant at the 5 percent level. All variables are averages over three years.

mator weighs the instruments asymptotically efficiently using the first-step estimates. However, in small samples like the one used here, standard errors tend to be under-estimated by the two-step estimator (Arellano, Bond 1991: 291).

Table 3 presents the results. The null hypothesis that corruption has no effect on capital account restrictions can be rejected for lag length one and two. As can be seen, the same is true if we use corruption as the dependent variable and test for the influence of restrictions. Table 4 proceeds by estimating corruption and capital account restrictions simultaneously, which amounts to a direct test of our theoretical model. We employ two-stage least squares (2SLS). 2SLS allows for the inclusion of endogenous regressors that are dependent variables from other equations in the system. The regressions focus on the final specifications of Tables 1 and 2.

As can be seen in Table 4, restrictions on the capital account breed corruption, whereas corruption leads to more restrictions. Both coefficients are significant at the one percent level. Compared to the individual estimations, the coefficients show a considerably stronger impact. A reduction in the intensity of controls by one point (i.e. the abolition of one restriction) leads to a decrease in corruption by 0.4 points. An increase in corruption by one point leads to 3.66 points more restrictions on the capital account. We test the robustness of these results in the next section.

Table 4

Determinants of Corruption and Capital Account Restrictions
panel data, 71 countries, 1984–2002, 2SLS

Dependent variable: corruption		Dependent variable: capital account restrictions	
Capital account restrictions	0.373 (3.96*)	Corruption	3.66 (3.18*)
Index of democracy	-0.026 (-1.09)	Socialist governments	0.187 (0.31)
Free press	0.003 (1.18)	Banking crises	0.552 (1.19)
Illiteracy rate(% of people ages 15 and above)	-0.002 (0.20)	ln(gdp per capita)	-0.772 (0.65)
		ln(population)	-4.104 (1.19)
		Monetary growth	0.0003 (0.95)
		GDP growth	-0.04 (-0.93)
Number of observations	364		364
R^2	0.70		0.20

The coefficients of the country and time dummies are not reported. – t-statistics in parentheses: *Significant at the 1 percent level. – **Significant at the 5 percent level. – [a]Significant at the 10 percent level. All variables are averages over three years.

3.4 Robustness Analysis[25]

We test for the robustness of the simultaneous regression of corruption and capital account restrictions reported in Table 4. First, we check for the influence of outliers using an algorithm that is robust to them. The algorithm minimizes the median (rather than the mean) of the residuals.[26] However, fixed effects cannot be included in these regressions. It turns out that our results are in part influenced by outlying observations: in the median regression, corruption no longer significantly influences restrictions. At the one percent level of significance, however, restrictions increase corruption.

As one obvious problem, our index of corruption is bounded between 0 and 6; the index of capital account restrictions is bounded between 0 and 4. Since OLS assumes that the dependent variable is unbounded, our second test for the stability of the results consists in re-estimating our regression with both indices transformed to unbounded variables. This transformation is usually done by taking the natural logarithm of $x/(x^{\max} - x)$, where x is the variable to be transformed and $x^{\max}$ is its maximum value. To avoid generating missing values, we redefine x as being equal to 10^{-9} in years where no restrictions have been in place or, respectively, $4 – 10^{-9}$ when the capital account has been fully restricted. We apply the same transformation to the index of corruption. The results show, that the transformation does again alter our main conclusions.

25 Detailed results are available upon request.

26 Least absolute value = $\min_b \; \underset{i}{median} \; |y_i - x_i b|$.

Whereas the significant impact of corruption on restrictions remains, corruption is no longer significantly influenced by restrictions.

Third, we employ an alternative index of corruption. This index has been constructed by *Transparency International* (Transparency International 2003) and ranges from 0 (no corruption) to 10 (high corruption).[27] Restrictions on the capital account significantly increase corruption as measured by this index. Again, corruption has no significant impact.

4. Conclusions

In a theoretical model we analyzed the interaction between government and investors, and the interaction of investors and civil servants. We demonstrated the existence of a nexus between corruption and capital account restrictions: while a higher level of corruption leads to stricter restrictions, a stricter level of restrictions leads to more corruption. Thus, corruption and restrictions reinforce each other mutually.

Using a panel of 121 countries, we tested this hypothesis and actually found a significant mutual relationship. Corruption and capital account restrictions influence each other simultaneously. Our results show that corruption leads to more restrictions on the capital account, while restrictions, in turn, breed corruption. However, our tests also show that these results are not completely robust regarding the method of estimation, the underlying sample, the choice of corruption index, and inclusion of explanatory variables.

Governments that hope to increase their capital tax revenue by the introduction of controls often neglect the negative equilibrium effect of increased corruption and evasion. Therefore, before introducing or tightening controls on capital, the pros and cons of such policy must be weighed carefully. Often investors and civil servants only need a few months to find ways to circumvent new restrictions. The net effect on tax revenues may thus well turn out to be small, and may even be overcompensated by the negative effects of higher corruption. Furthermore, our paper suggests that a country that follows such a policy may experience a vicious circle in the sense that corruption causes stricter controls, thereby increasing the level of corruption, which again causes stricter controls, and so on.

The same holds in the context of the debate about introducing tighter capital controls in the Western World to fight the "negative" effects of globalization. Even if controls can mitigate volatility and risk of crises (which many economists doubt), they may produce more harm than good as controls increase corruption.

[27] This index is available for different time periods, but is an aggregate of different surveys at different points in time. As the rankings of the index are thus not directly comparable over time, we do not report the results in a table.

References

Ades, A. and R. Di Tella (1994), Competition and Corruption. Institute of Economics and Statistics Discussion Papers 169. Oxford, UK.

Alesina, A. and B. Weder (1999), Do Corrupt Governments receive less Foreign Aid? NBER Working Paper 7108. NBER, Cambridge, MA.

Alfaro, L. (2001), Capital Controls: A Political Economy Approach. Harvard Business School Working Papers 02–012. Harvard University, Cambridge, MA.

Allingham, M.G. and A. Sandmo (1972), Income Tax Evasion: A Theoretical Analysis. *Journal of Public Economics* 1: 323–338.

Andvig, J.C. and K.O. Moene (1990), How Corruption may Corrupt. *Journal of Economic Behavior and Organizations* 13: 63–76.

Arellano, M. and St. Bond (1991), Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies* 58: 277–297.

Asiendu, E. and D. Lien (2003), Capital Controls and Foreign Direct Investment. *World Development* 32 (3): 479–490.

Bai, Chong-En and Shang-Jin Wei (2001), The Quality of Bureaucracy and Capital Account Policies. World Bank Working Paper Series 2575. World Bank, Development Research Group, Washington, DC.

Banks, A.S. (2002), *Cross-National Time-Series Data Archive*. Binghamton, NY, Banner Software, Inc.

Bardhan, P. (1997), Corruption and Development: A Review of Issues. *Journal of Economic Literature* 35 (3): 1320–1346.

Bartoli, L. and A. Drazen (1997), Capital-Account Liberalization as a Signal. *American Economic Review* 87(1): 138–154.

Beck, Th., A. Demirgüç-Kunt and R. Levine (2001), New Tools in Comparative Political Economy: The Database of Political Institutions. *World Bank Economic Review* 15(1): 165–176.

Beilharz, H.-J. and H. Gersbach (2004), General Equilibrium Effects and Voting into a Crisis. CEPR Discussion Paper 4454. London. Internet: http://ssrn.com/abstract=570183.

Branson, W.B. (1989), *Macroeconomic Theory and Policy*. 3rd ed., New York: Harper & Row.

Brune, N., G. Garrett, A. Guisinger and J. Sorens (2001), *The Political Economy of Capital Account Liberalization*. Paper prepared for the 2001 Annual Meeting of the American Political Science Association, San Francisco.

Burgess, R. and N. Stern (1993), Taxation and Development. *Journal of Economic Literature* 31 (2): 762–830.

Cadot, O. (1987), Corruption as a Gamble. *Journal of Public Economics* 33: 223–244.

Capiro, G. and D. Klingebiel (2003), *Episodes of Systemic and Borderline Financial Crises*. World Bank, Washington, DC.

CIA – Central Intelligence Agency (ed.) (2002), *World Factbook*. Washington, DC. Internet: www.odci.gov/cia/publications/factbook/, downloaded 26.11.2003.

Cukierman, A., S.B. Webb and B. Neyapti (1992), Measuring the Independence of Central Banks and its Effects on Policy Outcomes. *World Bank Economic Review* 6: 353–398.

DeLong, B. and B. Eichengreen (2002), Between Meltdown and Moral Hazard: The International Monetary and Financial Policies of the Clinton Administration. In J. Frankel and P. Orszag (eds.), *American Economic Policy in the 1990s*. Cambridge, MA: MIT Press: 191–254.

Dooley, M. and P. Isard (1980), Capital Controls, Political Risk and Deviations from Interest-Rate Parity. *Journal of Political Economy* 88: 370–384.

Drabek, Z. and W. Payne (2001), The Impact of Transparency on Foreign Direct Investment. WTO Working Paper ERAD-99-02. WTO, Geneva.

Drazen, A. (2000), *Political Economy in Macroeconomics*. Princeton, NJ: Princeton University Press.

Dreher, A. (2005), Does Globalization Affect Growth? *Applied Economics*, forthcoming.

Dreher, A. and Th. Herzfeld (2005), *The Economic Costs of Corruption*: A Survey and New Evidence. Mimeo, University of Konstanz and University of Kiel.

Dreher, A., Ch. Kotsogiannis and St. McCorriston (2004), *Corruption Around the World*: Evidence from a Structural Model. Mimeo, University of Exeter.

Edwards, S. (1999), How Effective are Capital Controls? NBER Working Paper 7413. NBER, Cambridge, MA

El-Shagi, M. (2005), *A legal Crime*: Capital Controls as an Act of Corruption. Mimeo, University of Mannheim.

Fisher, I. (1930), *The Theory of Interest as Determined by Impatience to Spend Income and Opportunity to Invest It*. New York: Macmillan.

Gersbach, H. and A. Schniewind (2001), Awareness of General Equilibrium Effects and Unemployment. IZA Discussion Paper 394. IZA, Bonn.

Giavazzi, F. and M. Pagano (1988), Capital Controls in the EMS. In D.E. Fair and C. de Boissieu (eds.), *International Monetary and Financial Integration*: The European Dimension. Dordrecht: Kluwer Academic, 261–289.

Glick, R. and M.M. Hutchison (2005), Capital Controls and Exchange Rate Instability in Developing Economies. *Journal of International Money and Finance* 24 (3): 387–412.

Granger, C.W.J. (1969), Testing for Causality and Feedback. *Econometrica* 37 (3): 424–438.

Grilli, V. and G.M. Milesi-Ferretti (1995), Economic Effects and Structural Determinants of Capital Controls. *IMF Staff Papers* 42 (3): 517–551.

Gruben, W.C. and D. McLeod (2001), Capital Account Liberalization and Disinflation in the 1990s. Federal Reserve Bank of Dallas CLAE Working Paper 0101. Dallas, TX.

IMF – International Monetary Fund (various years), *Annual Report on Exchange Arrangement and Exchange Restrictions*. Washington, DC.

Lambsdorff, J. Graf (2002), How Corruption Affects Persistent Capital Flows. *Economics of Governance*, forthcoming.

Lederman, D., N. Loayaza and R. Reis Soares (2001), *Accountability and Corruption*: Political Institutions Matter. University of Chicago and World Bank, Chicago and Washington, DC.

Marshall, M.G. and K. Jaggers (2000), *Polity IV Project: Political Regime Characteristics and Transitions, 1800–2000*. Center for International Development and Conflict Management, University of Maryland, College Park, MD. Internet: www.cidcm.umd.edu/inscr/polity/, downloaded 17.10.2003.

Mas-Colell, A., M.D. Whinston and J.R. Green (1995), *Microeconomic Theory*. New York, Oxford: Oxford University Press.

Milesi-Ferretti, G.M. (1998), Why Capital Controls? Theory and Evidence. In S. Eijffinger and H. Huizinga (eds.), *Positive Political Economy*: Theory and Evidence. Cambridge, UK: Cambridge University Press, 217–247.

Neely, Ch.J. (1999), An Introduction to Capital Controls. *Federal Reserve Bank of St. Louis Review* 81 (6): 13–30.

Nickell, St.J. (1981), Biases in Dynamic Models with Fixed Effects. *Econometrica* 49: 1417–1426.

Romer, D. (2003), Misconceptions and Political Outcomes. *Economic Journal* 113 (484): 1–20.

Rubenstein, A. (1998), *Modeling Bounded Rationality*. Cambridge, MA, and London: MIT Press.

Saha, B. (2001), Red Tape, Incentive Bribe and the Provision of Subsidy. *Journal of Development Economics* 65: 113–133.

Saint-Paul, G. (2000), The "New Political Economy": Recent Books by Drazen and by Persson and Tabellini. *Journal of Economic Literature* 38 (4): 915–925.

Sargent, Th. (1993), *Bounded Rationality in Macroeconomics*. Oxford: Clarendon Press.

Shleifer, A. and W. Vishny (1993), Corruption. *Quarterly Journal of Economics* 108 (3): 599–617.

Smarzynska, B.K. and Sh.-J. Wei (2000), Corruption and Composition of Foreign Direct Investment. NBER Working Paper 7969. NBER, Cambridge, MA.

Srinivasan, T.N. (1973), Tax Evasion: A Model, *Journal of Public Economics* 2: 339–346.

Stackelberg, H. von (1934), *Marktform und Gleichgewicht*. Berlin and Wien: Springer.

Stockman, A.C. and A.D. Hernandez (1988), Exchange Controls, Capital Controls, and International Financial Markets. *American Economic Review* 78 (3): 362–374.

Transparency International (ed.) (2003), *Corruption Perceptions Index*. Berlin. Internet: www.transparency.org/surveys/index.html#cpi, downloaded 16.10.2003.

Treisman, D. (2000), The Causes of Corruption: A Cross-National Study. *Journal of Public Economics* 76: 399–457.

Wheeler, D. and A. Mody (1992), International Investment Location Decision: The Case of U.S. Firms. *Journal of International Economics* 33: 57–76.

Wei, Shang-Jin (1999), Does Corruption Relieve Foreign Investors of the Burden of Taxes and Capital Controls? World Bank Working Paper Series 2429. World Bank, Washington, DC.

World Bank (ed.) (2001), Homepage. Washington, DC. Internet: www1.worldbank.org/publicsector/anticorrupt/index.ctm, downloaded 23.6.2004.

World Bank (ed.) (2002), World Development Indicators – WDI. CD-Rom. Washington, DC.

Appendix A: Proofs

Proof of Proposition 2:
In the capital control scenario, $R = R_d$ requires $K^{cc} = K^{lf}$. The latter, in turn, is equivalent to $K_f^{lf} - K_f^{cc} = K_d^{cc} - K_d^{lf}$. Due to arbitrage it is clear that each increase in $K_d^{cc} - K_d^{lf}$, caused by the capital control, will be compensated by a decrease of K_f^{cc}, so that $R = R_d$ remains. However, reaching $K_f^{cc} = 0$ this becomes impossible and the domestic return R_d falls short to R: $R_d < R$. The corresponding threshold is at $\widehat{K}_f^{lf} = K_d^{cc} - K_d^{lf}$, because more than a complete capital flight of the foreign capital cannot occur. We know that $K_d^{cc} = D^{cc} = W - c_1^{cc} - \overline{F} - x^{cc}$ and $K_d^{lf} = D^{lf} = W - c_1^{lf} - F^{lf}$. Thus:

$$\widehat{K}_f^{lf} = \left(c_1^{lf} - c_1^{cc}\right) + \left(F^{lf} - \overline{F} - x^{cc}\right)$$

As long as $R = R_d$ there is no effect on the present value of income or on the intertemporal price, that is, $c_1^{lf} = c_1^{cc}$. Therefore, we obtain $\widehat{K}_f^{lf} = F^{lf} - \overline{F} - x^{cc}$ (q.e.d.).

Appendix B: Definitions and Data Sources

Variable	Source	Definition
Corruption	International Country Risk Guide	Range 0 (no corruption) to 6 (highest corruption).
Capital account restrictions	Grilli, Milesi-Ferretti (1995), updated	Range 0 (no restrictions) to 4 (fully restricted).
index of democracy	Marshall, Jaggers (2000)	Measures the general openness of political institutions (0 = low, 10 = high democracy score).
Government fractionalization	Beck et al. (2001)	The probability that two deputies picked at random from among the government parties will be of different parties.
Opposition fractionalization	Beck et al. (2001)	The probability that two deputies picked at random from among the opposition parties will be of different parties.
Competitive nomination	Banks (2002)	Index: (3) Competitive, (2) Partly Competitive, (1) Essentially Non-Competitive, (0) No Legislature
Free press	Freedom House, Press Freedom Survey, various years	http://www.freedomhouse.org/research/pressurvey.htm
Fixed exchange rate	IMF, various years	Dummy is equal to zero if a currency is freely fluctuating, and 1 otherwise.
Share of protestants	Treisman (2000), CIA (2002)	Protestant population in percent
Openness	World Bank (2002)	The sum of exports and imports of goods and services measured as a share of GDP.
Government revenue	World Bank (2002)	General government final consumption expenditure in percent of GDP.
ln(gdp per capita)	World Bank (2002)	GDP divided by midyear population (in constant 1995 US$).
Illiteracy rate (% of people ages 15 and above)	World Bank (2002)	The percentage of people ages 15 and above who cannot, with understanding, read and write a short, simple statement on their everyday life.
Socialist governments	Beck et al. (2001)	Chief Executive's party is defined as communist, socialist, social democratic, or left-wing.
Political instability	Dreher (2005)	Index constructed with principal components analysis. The weights obtained for the components are 0.08 (assassination), 0.1 (strikes), 0.25 (guerrilla warfare), 0.15 (crisis), 0.16 (riots) and 0.27 (revolutions).
Banking crises	Glick, Hutchison (2005)	Dummy takes value of one if a crisis occurred that year, zero otherwise.
Currency crises	Glick, Hutchison (2005), Capiro, Klingenbiel (2003)	Dummy takes value of one if a crisis occurred that year, zero otherwise.
Monetary growth	World Bank (2002)	Money and quasi money growth (annual %).
Gross domestic savings	World Bank (2002)	Gross domestic savings are calculated as GDP less final consumption expenditure.
ln(population)	World Bank (2002)	All residents regardless of legal status or citizenship.
GDP growth	World Bank (2002)	Annual percentage growth rate of GDP at market prices based on constant local currency.

Appendix C: Descriptive Statistics

Variable	Mean	Std. Dev. (overall)
Corruption	3.38	1.40
Capital account restrictions	2.01	1.35
Index of democracy	5.17	4.16
Government fractionalization	0.20	0.27
Opposition fractionalization	0.47	0.29
Competitive nomination	1.41	0.64
Free press	42.77	32.93
Fixed exchange rate	0.60	0.46
Share of protestants	0.57	3.15
Openness	74.52	49.67
Government revenue	25.00	10.99
ln(gdp per capita)	7.82	1.59
Illiteracy rate (% of people ages 15 and above)	26.54	22.40
Socialist governments	0.31	0.45
Political instability	0.21	0.37
Banking crises	0.21	0.36
Currency crises	0.13	0.24
Monetary growth	62.27	383.83
Gross domestic savings	18.69	11.64
ln(population)	16.02	1.66
GDP growth	2.96	3.83