# Corruption, Globalization, and Economic Growth: Theory and Evidence

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# Corruption, Globalization, and Economic Growth: Theory and Evidence

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**Abstract**

We investigate, both theoretically and empirically, how the negative effects of government corruption on economic growth are magnified or reduced by capital account liberalization. Our model shows that highly corrupt countries impose higher tax rates than do less corrupt countries, thereby, magnifying the negative impacts of government corruption on economic growth in the highly corrupt countries and reducing the impacts in the less corrupt countries if capital account liberalization is enacted. Empirical evidence obtained from an analysis of the panel data collected from 111 countries supports our theoretical predictions. Our theoretical and empirical results contribute to the recent policy debates on the merits or demerits of capital account liberalization.

**JEL classification**: O40; O43; F43; E62.
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# 1 Introduction

Many researchers have emphasized the importance of the effects of government corruption on economic growth and development from both a theoretical and an empirical perspective (e.g., de Vaal and Ebben, 2011; Ehrlich and Lui, 1999; Glaeser and Saks, 2006; Mauro, 1995, 2004; Mo, 2001; Shleifer and Vishny, 1993).[1] Corrupt officials may waste public funds, for instance, by awarding contracts to the private agents who pay the largest bribes rather than to those who are the most efficient or by putting collected taxes directly into their own pockets (Weil, 2008).[2] The World Bank estimates that the entire economy in the world incurs corruption costs of more than one trillion dollars a year.[3]

North (1990) asserts that an efficient institution that ensures the secured property rights, which derive incentives to invest or innovate, is crucial for economic growth and development. Countries with weak institutions often do not establish the rule of law, and thus, property rights are not secured. If property rights are not secured, economic agents lack the incentive to invest or innovate because the return on investment or innovation could be plundered from investors. Many researchers have produced empirical evidence to support North's assertion (e.g., Acemoglu et al., 2001, 2002; Knack and Keefer, 1995).

Government corruption and a weak institution are often interrelated. In countries with a poor quality legal enforcement system, government corruption is often prevalent because corrupt government officials are not punished by the law if a country has a weak judicial system. In turn, government corruption often causes an inefficient and weak institution because corrupt government officials have strong incentives to establish and maintain a poor

[1]Moreover, Wei (2000a, 2000b) has studied the effects of corruption on foreign direct investment (FDI) and has found that corruption is a significant obstacle to FDI.

[2]Corruption takes many forms, such as bribes to government officials from tax payers, trades of official contracts for cash payments, and embezzlement of public funds. The World Bank (1997, 2001) identifies the root causes of corruption.

[3]See the News & Broadcast of the World Bank at http://go.worldbank.org/LJA29GHA80. According to this article, one trillion dollars were paid worldwide in 2001-2002 as actual bribes in both rich and developing countries. Note that this one trillion dollars does not include the embezzlement of public funds or the theft of public assets. Daniel Kaufmann, the World Bank Institute's director for Governance, says that "it is important to emphasize that this is not simply a developing country problem but that fighting corruption is a global challenge."

quality legal enforcement system if the gains from corruption are greater than the wages of government officials (Acemoglu and Verdier, 1998; Becker and Stigler, 1974).

As such, it is now widely accepted that weak institutions and corruption are serious obstacles to economic growth and development; however, how capital account liberalization affects the negative impacts of corruption (or weak institutions) on economic growth has been unexplored. The objective of this research is to demonstrate that it is important to investigate economic growth from the perspectives of both financial globalization and government corruption.

The effects of financial globalization on economic growth have been extensively investigated by many researchers (e.g., Chanda, 2005; Eichengreen and Leblang, 2003; Quinn, 1997; Quinn and Toyoda, 2008; Rodrik, 1998). However, it remains unclear whether financial globalization is beneficial to all countries as many pieces of mixed evidence have been produced.[4] Moreover, whether financial globalization is beneficial to countries with strong institutions remains unclear as well. While Krray (1998), Bekaert et al. (2005), and Quinn and Toyoda (2008) find no evidence that capital account liberalization positively affects economic growth even though a country has a high level of institutional quality, Arteta et al. (2003), Durham (2004), and Klein (2005) find supportive evidence for its positive effects, although the result is not very robust depending upon the specifications and the sample period. In this research, we re-examine whether capital account liberalization is beneficial to countries with good institutions, focusing on the effects of government corruption on economic growth. In particular, we address, both empirically and theoretically, the extent to which capital account liberalization amplifies or reduces the negative effects of government corruption on economic growth.

The theoretical part of our research is related to the work of Tornell and Velasco (1992), who essentially demonstrate that better institutions promote capital inflow and economic growth. While their study has focused on the role of a country's institution in investigating

[4]See Kose et al. (2009, 2010) for the comprehensive survey of the literature on financial globalization.

the interaction between financial globalization and economic growth, they have not explicitly emphasized the importance of government corruption. In contrast, we incorporate the behavior of a corrupt government into our model as did Mauro (2004) and de Vaal and Ebben (2011). Unlike Mauro (2004) and de Vaal and Ebben (2011), however, we study a two-country model in which the two countries differ in the degree of corruption.

Our theoretical findings are that if government corruption is less prevalent in a country, capital account liberalization leads to a higher growth rate; whereas if government corruption is highly prevalent in a country, capital account liberalization leads to a lower growth rate. These findings are novel theoretical contributions to the literature on corruption and growth. The mechanism behind these results is as follows. In our model, if a country is financially closed to the world market, government corruption only causes a higher tax rate on labor income, and thus, the magnitude of government corruption on the economic growth is relatively limited. Meanwhile, if two countries are financially integrated, the tax rate on an investment project becomes higher in the highly corrupt country than in the less corrupt country. Consequently, financial capital flows into a less corrupt country from a highly corrupt country because the return on investment in the highly corrupt country is smaller than in the less corrupt country. Accordingly, in the two-country setting, the negative impacts of government corruption in the highly corrupt country are magnified, while they are reduced in the less corrupt country.

These theoretical consequences are consistent with the existing empirical evidence, showing that weak institutional circumstances in poor countries are obstacles to capital inflow from rich countries, and they may even induce capital flight from the poor countries (e.g., Alfaro et al., 2008; Wei, 2000a, 2000b). Under the circumstances in which government corruption is prevalent and the rule of law is undermined, if a country opens its financial market to the world market, it is highly likely that capital flows out of the country and economic growth is significantly dampened more so than when the country is a closed economy.

According to standard neo-classical growth models, financial globalization generates economic advantages for all countries participating in the international financial market as rich countries are given new investment opportunities in poor countries and, in turn, poor countries, where marginal product of capital is higher than in rich countries, obtain otherwise scarce capital stock from rich countries. In reality, however, capital does not flow from rich countries to poor countries as much as neo-classical growth models predict (Lucas, 1990; Obstfeld and Taylor, 2004; Stulz, 2005). The volume of capital that moved to poor countries in recent years is a very small proportion of the total capital flow in the international financial market (Mishkin, 2007). In this sense, our theoretical part contributes to the literature on the Lucas paradox.

Moreover, we empirically examine the effects of government corruption on economic growth by analyzing the panel data from 111 countries. Our empirical evidence is consistent with our theoretical findings, namely, capital account liberalization is beneficial to less corrupt countries but is disadvantageous to highly corrupt countries. Our empirical findings are complementary to evidence reported in the existing literature on financial globalization and growth (e.g., Arteta et al., 2003; Durham, 2004; Klein, 2005) and on corruption and growth (e.g., Ehrlich and Lui, 1999; Mauro, 1995; Mo, 2001).

The remainder of this paper proceeds as follows. In the next section, we develop a model to explain how the magnitude of government corruption is amplified in the case of an open economy relative to that of a closed economy. In section 3, we derive equilibrium growth rates both in the case of the closed economy and in the case of the open economy. Section 4 discusses the mechanism through which the effects of government corruption on growth-rate differences are magnified in the two-country setting compared with the closed economy case. In section 5, we provide empirical evidence for our theoretical findings. Section 6 presents concluding remarks.

## 2 Model

An economy consists of the government, an infinitely-lived representative firm, and overlapping generations. Each individual in a generation lives for two periods, meaning that young and old agents always coexist in each period. Time is discrete, expanding from 0 to $\infty$. Each individual born at time $t$ exclusively obtains the utility from his/her second-period consumption $c_{t+1}$. As there is no uncertainty in our economy, without loss of generality, we can assume that the utility function is linear with respect to his/her second-period consumption, that is, $u(c_{t+1}) := c_{t+1}$. The population of each generation is constant over time. The timing of events from time $t$ to time $t+1$ is described as follows.

- Individuals are born at the beginning of time $t$.
- Production at time $t$ occurs and individuals earn wages. The government collects corporate tax from the representative firm.
- Individuals make decisions on how much they invest, borrow, and/or lend.
- At the end of time $t$, the government makes decisions on corruption and the corporate tax rate imposed on the production of the representative firm for time $t+1$.
- Production at time $t+1$ occurs and the government collects corporate tax from the representative firm. Individuals receive the return on investment and lending. They repay their obligations if they borrowed at time $t$. Individuals consume all their income.

As will be addressed later, the choice variables of the government are a misappropriation share of public funds and the corporate tax rate. We assume that a certain proportion of private individuals have close relationships with the government, and these private individuals misappropriate public funds through their abuses.[5] In this sense, the government is sub-benevolent because the government decisions are biased toward those individuals colluding

[5] In this paper, the ratio of corrupt individuals to all individuals does not matter. What matters is that there are those individuals who have close relationships with the government.

with the government. Without collusion, the government would choose the corporate tax so as to maximize per capita consumption in the economy. Note that because the collective decisions of the government are made at the end of time $t$, neither old agents at time $t$ nor young agents at time $t+1$ are involved in the political process of the decision making regarding time $t+1$. The government commits to its decisions made at the end of time $t$ in conducting its policy at time $t+1$.

In this economy, there are three kinds of capital. The first is real capital, which is supplied by individuals in an economy. The real capital is broadly thought of as a combination of physical capital and human capital. The real capital is country-specific, implying that it is not tradable between countries. The second is public capital, which is supplied by the government. One may think that public capital forms an infrastructure in the economy, which positively affects the final production of the economy. Both the real capital and the public capital depreciate entirely in one period. The third is financial capital, which can be used as resources for borrowing and lending in the financial sector. If countries are internationally integrated, financial capital is traded in the international financial market.

## 2.1 Production Sector

Final goods are produced from real capital and labor. Similar to Barro (1990) and Futagami et al. (1993), we incorporate public capital into the production function. Specifically, the production function is given by a Cobb-Douglas form as follows:

$$Y_t = AZ_t^{\alpha}\left[(1-\theta_t)\, g_t L_t\right]^{1-\alpha},$$

where $Y$ is the output, $L$ is the aggregate labor, $Z$ is the aggregate real capital, and $A$ is the technology level of the production function. We denote public spending per young agent by $g$. Because there are leakages of public spending due to the government corruption, public capital is created from public spending with a less-than-one-for-one relationship. Specifically, public capital is given by $(1-\theta)\,g$ where $0<\theta<1$. $\theta g$ is waste from the perspective of the production sector. The wasted resources are embezzled by individuals colluding with the government. In other words, $\theta$ is thought of as the misappropriation share of public funds, which will be determined by the government's collective decision.

Because the government imposes corporate tax on the final production, the representative firm maximizes its net profit, $(1-\tau_t)\,Y_t - w_t L_t - q_t Z_t$, where $\tau$ is the tax rate on the final production, $w$ is the wage rate, and $q$ is the price of the real capital. Note that the representative firm maximizes its profit, taking the government's behavior as given. In this sense, the government and the representative firm are in a game-theoretic situation, where the government is a Stackelberg leader and the representative firm is a Stackelberg follower. Given the misappropriation rate, $\theta$, and the tax rate, $\tau$, the production factors in competitive markets are paid their marginal products:

$$q_t = \alpha\,(1-\tau_t)\,Y_t/Z_t \tag{1}$$

$$w_t = (1-\alpha)\,(1-\tau_t)\,Y_t/L_t. \tag{2}$$

## 2.2 Individuals

Each individual faces budget constraints in the first and second periods as follows:

$$k_t + d_t \leq w_t, \tag{3}$$

and

$$c_{t+1} \leq q_{t+1}\phi k_t + r_{t+1} d_t, \tag{4}$$

where $k$ is the investment in a project and $d$ is lending when positive and borrowing when negative. If an individual starts an investment project when young, then he/she produces real capital $\phi k$ in the second period sold to the representative firm at price $q$, and $\phi$ is the productivity of real capital production. If he/she lends financial capital in the first period, he/she receives the gross return, $r$, from the lending in the second period. If he/she borrows financial capital in the first period, he/she pays the gross interest rate $r$ in the second period, the same rate as borne on the lending.

Due to an agency problem, investors face borrowing constraints. Following Aghion et al. (2005), a credit constraint facing each individual is given by:

$$d_t \geq -\nu w_t, \tag{5}$$

where $\nu \in [0, \infty)$ is the measure of the degree of credit constraints. We note that individuals can borrow financial capital up to $\nu$ times $w$. $w$ is considered a down-payment for the investment project. In Appendix A.1, we provide two kinds of microfoundations for Eq. (5).[6] The non-negativity constraint for the investment project is given by:

$$k_t \geq 0. \tag{6}$$

Now we introduce heterogeneity of individuals with respect to the productivity of real capital creation. Specifically, the productivity $\phi$ varies between individuals and is distributed uniformly over $[0, 1]$. Each individual knows his/her own productivity at birth, while other individuals do not know their productivity.

Each individual maximizes $c_{t+1}$ subject to inequalities (3)-(6). The maximization problem is rewritten as:

$$\max_{d_t} \left(r_{t+1} - \phi q_{t+1}\right) d_t$$

subject to

$$-\frac{\mu}{1-\mu} w_t \leq d_t \leq w_t,$$

where $\mu := \frac{\nu}{1+\nu}$. When $r_{t+1} - \phi q_{t+1} > 0$, it is optimal for an individual to choose $d_t = w_t$ and $k_t = 0$, whereas when $r_{t+1} - \phi q_{t+1} < 0$, then it is optimal to choose $d_t = -\frac{\mu w_t}{1-\mu}$ and $k_t = \frac{w_t}{1-\mu}$. Formally, we obtain:

**Lemma 1** *Let $\phi_t := \frac{r_{t+1}}{q_{t+1}}$. The following hold.*

- *If $\phi_t > \phi$, then $k_t = 0$ and $d_t = w_t$.*

[6] We implicitly assume the existence of a financial intermediary for the loan contracts between savers and borrowers. See Appendix A.1 for the microfoundations for a credit constraint (5). This type of assumption for credit market imperfections is often imposed in the literature (e.g., Aghion and Barnergee, 2005; Aghion et al, 1999; Aghion et al., 2005). Even if we replace the inequality (5) with $b_t \geq -\mu k_t$ where $\mu \in [0, 1)$, this alternative credit constraint is equivalent to the inequality (5), and the same results will be obtained.

- *If* $\phi_t < \phi$, *then* $k_t = \frac{w_t}{1-\mu}$ *and* $d_t = -\frac{\mu w_t}{1-\mu}$.

## 2.3 The Government's Behavior

The government runs a balanced budget, which is given by:

$$g_{t+1}L_{t+1} = \tau_{t+1}Y_{t+1}.$$

Using this equation, we rewrite the production function as follows:

$$Y_{t+1} = A^{1/\alpha}\left(1-\theta_{t+1}\right)^{(1-\alpha)/\alpha}\tau_{t+1}^{(1-\alpha)/\alpha}Z_{t+1}, \tag{7}$$

Thus the capital price and wage become:

$$q_{t+1} = \alpha A^{1/\alpha}\left(1-\tau_{t+1}\right)\left(1-\theta_{t+1}\right)^{(1-\alpha)/\alpha}\tau_{t+1}^{(1-\alpha)/\alpha} \tag{8}$$

$$w_{t+1} = \left(1-\alpha\right)A^{1/\alpha}\left(1-\tau_{t+1}\right)\left(1-\theta_{t+1}\right)^{(1-\alpha)/\alpha}\tau_{t+1}^{(1-\alpha)/\alpha}z_{t+1}, \tag{9}$$

where $z_{t+1} := Z_{t+1}/L_{t+1}$.

The aggregate real capital supplied by investors is given by:

$$Z_{t+1} = \int_{\phi_t}^{1}\phi k_t L_t d\phi = \frac{w_t\left(1-\phi_t^2\right)}{2\left(1-\mu\right)}L_t. \tag{10}$$

Because $L_{t+1} = L_t$ and from Eqs. (9) and (10), we obtain the law of motion of real capital as follows:

$$z_{t+1} = \frac{\left(1-\tau_t\right)\tau_t^{(1-\alpha)/\alpha}\left(1-\alpha\right)A^{1/\alpha}\left(1-\theta_t\right)^{(1-\alpha)/\alpha}\left(1-\phi_t^2\right)}{2\left(1-\mu\right)}z_t. \tag{11}$$

The dynamics of real capital is subject to the tax rate, the misappropriation share of public funds, the degree of credit constraints, and the number of savers (borrowers).

We assume that the proportion $\gamma$ of the total population in each generation is involved in a political process, and they misappropriate public funds. Collective decisions on both the tax rate ($\tau_{t+1}$) and the degree of political corruption ($\theta_{t+1}$) are made by agents born at time $t$ and colluding with the government. They maximize a geometric average between per capita consumption and embezzlement of public funds as follows:

$$\max_{\tau_{t+1},\theta_{t+1}} \bar{c}_{t+1}^{1-\beta}b_{t+1}^{\beta},$$

where $\bar{c}$ is the per capita consumption and $b$ is the per capita embezzlement received by agents colluding the government. $\beta$ is a measure of the degree of political corruption.[7] Because the government is a Stackelberg leader, it solves its maximization problem by taking into account the representative firm's first-order conditions, namely, Eqs. (8) and (9).

Consumption by individuals with $\phi < \phi_t$ is given by $c_{t+1} = \phi_t q_{t+1} w_t$ and consumption by individuals with $\phi > \phi_{t+1}$ is given by $c_{t+1} = \frac{1}{1-\mu}(\phi - \mu\phi_t) q_{t+1} w_t$. Therefore, we obtain:

$$\begin{aligned} \frac{\bar{c}_{t+1}}{q_{t+1} w_t} &= \phi_t \int_0^{\phi_t} d\phi + \frac{1}{1-\mu} \int_{\phi_t}^{1} (\phi - \mu\phi_t) d\phi, \\ &= \frac{1}{2(1-\mu)} \left( \phi_t^2 - 2\mu\phi_t + 1 \right). \end{aligned} \tag{12}$$

It follows from Eqs. (7) and (10) that:

$$Y_{t+1} = A^{1/\alpha} (1-\theta_{t+1})^{(1-\alpha)/\alpha} \tau_{t+1}^{(1-\alpha)/\alpha} \left(1 - \phi_t^2\right) w_t L_t / \left(2(1-\mu)\right).$$

Hence, the per capita embezzlement of public fund, $b_{t+1} = \theta_{t+1} g_{t+1}/\gamma$, is given by:

$$b_{t+1} = \frac{\theta_{t+1}\tau_{t+1}Y_{t+1}}{\gamma L_t} = A^{1/\alpha}\theta_{t+1}(1-\theta_{t+1})^{(1-\alpha)/\alpha} \tau_{t+1}^{1/\alpha} \frac{(1-\phi_t^2) w_t}{2(1-\mu)\gamma}.$$

Because the choice variables of the collective decisions are $\tau_{t+1}$ and $\theta_{t+1}$, and $q_{t+1}$ is given by Eq. (8), the government's maximization problem is converted into two independent maximization problems:

$$\max_{\tau_{t+1}} (1-\tau_{t+1})^{1-\beta} \tau_{t+1}^{\frac{(1-\alpha)(1-\beta)+\beta}{\alpha}},$$

and

$$\max_{\theta_{t+1}} (1-\theta_{t+1})^{\frac{1-\alpha}{\alpha}} \theta_{t+1}^{\beta}.$$

The solutions to these two maximization problems are given by:

$$\tau^* := (1-\alpha)(1-\beta) + \beta$$

and

$$\theta^* := \frac{\alpha\beta}{(1-\alpha)(1-\beta)+\beta}.$$

[7] This maximization is equivalent to the maximization of a geometric average between the total disposable income and the total embezzlement at time $t+1$, that is, $\max_{\tau_{t+1},\theta_{t+1}} \left[(1-\tau_{t+1}) Y_{t+1}\right]^{1-\beta} \left[\theta_{t+1}\tau_{t+1}Y_{t+1}\right]^{\beta}$.

These two solutions imply that the corporate tax rate and the misappropriation share of public funds are increasing functions with respect to the degree of political corruption. If there are no corruption motives, that is, $\beta = 0$, the tax rate is equal to $1 - \alpha$, which is the same rate that Barro (1990) derives.

Thus far, we have considered only the misappropriation of public funds as government corruption. However, we can view government corruption from the perspective of bribes, as well. The tax rate $1 - \alpha$ maximizes per capita consumption. Therefore, we consider that the representative firm bribes government officials with $[\tau^* - (1 - \alpha)]Y = \alpha\beta Y$ as the corrupt officials require the representative firm to do so. The representative firm must think of $\alpha\beta Y$ as an extra tax payment that would not have been incurred if the government had not been corrupt.

Since $(1 - \theta^*)\tau^* = 1 - \alpha$, the capital price and wage rate become:

$$\bar{q} \ : \ = \alpha A^{1/\alpha} (1-\alpha)^{(1-\alpha)/\alpha} (1-\tau^*) \tag{13}$$

$$\bar{w}_t \ : \ = (1-\alpha)^{1/\alpha} A^{1/\alpha} z_t (1-\tau^*) \,. \tag{14}$$

Defining the growth rate of an economy as $\Gamma_{t+1} := \frac{z_{t+1}}{z_t}$, we have:

$$\Gamma_{t+1} := \frac{(1-\tau^*)(1-\alpha)^{1/\alpha} A^{1/\alpha} (1-\phi_t^2)}{2(1-\mu)}. \tag{15}$$

# 3 Equilibrium Growth Rates

The equilibrium growth rate is derived from Eq. (15) such that the domestic financial market clears (in the case of a closed economy model) or the world financial market clears (in the case of a two-country model).

## 3.1 Closed Economy Model

In a closed economy, the financial market clears within a country. From Lemma 1, the financial market clearing condition is given by:

$$w_t \phi_t - \frac{\mu w_t}{1-\mu}(1-\phi_t) = 0,$$

or equivalently,

$$\phi_t = \mu. \tag{16}$$

In this case, the equilibrium growth rate of the closed economy becomes:

$$\Gamma_{t+1} := \frac{(1-\tau^*)(1-\alpha)^{1/\alpha} A^{1/\alpha} (1-\mu^2)}{2(1-\mu)}. \tag{17}$$

Note that the growth rate declines as the corruption parameter, $\beta$, increases in a closed economy due to the higher tax rate on the wage income.

## 3.2 Two-Country Model

Now we suppose that the world economy consists of two countries, say country 1 and country 2. To investigate the effects of government corruption on economic growth, we assume that the two countries are identical in terms of the degree of credit constraints, technology, and size of the population but not identical for the degree of government corruption. We impose a parameter condition in Assumption 1 below.

**Assumption 1**

$$\mu\left(1-\beta^1\right) \leq 1-\beta^2 < 1-\beta^1. \tag{18}$$

In the second inequality of Assumption 1, we suppose that the degree of corruption of country 1 is less than that of country 2, that is, $\beta^1 < \beta^2$. Accordingly, the equilibrium tax rate of country 1 is less than that of country 2 ($\tau^1 < \tau^2$). The misappropriation share of public funds of country 1 is less than that of country 2 ($\theta^1 < \theta^2$) as well. The first inequality guarantees that $\phi_t^2$ is less than one for all $t \geq 0$. In other words, there are always agents who create capital in country 2 due to the first inequality.[8] If the degree of credit constraints, $\mu$, is so large that $\mu(1-\beta^1) > 1-\beta^2$, then no one will produce real capital in country 2 for sufficiently large $t$. We avoid this case for simplicity.

If each country is a closed economy, the growth rate of country 1 is greater than that of country 2 because $\tau^1 < \tau^2$. However, if the two countries are financially integrated at

[8]As it holds that $\phi_t^1 < \phi_t^2$ in equilibrium, $\phi_t^1 < 1$ is always guaranteed.

time $t$, they face a common world interest rate at time $t+1$. Therefore, it holds that $r_{t+1} = \bar{q}^1 \phi_t^1 = \bar{q}^2 \phi_t^2$, which is rewritten as:

$$\left(1-\beta^1\right)\phi_t^1 = \left(1-\beta^2\right)\phi_t^2$$

because $1-\tau^i = \alpha\left(1-\beta^i\right)$. It follows from $\beta^1 < \beta^2$ that $\phi_t^1 < \phi_t^2$, implying that when the two countries are financially integrated, the number of savers (borrowers) in country 2 is greater (smaller) than in country 1.

Because the international financial market clears over the two countries, it must hold that $B_{t+1}^1 + B_{t+1}^2 = 0$ where the foreign financial asset that country $i$ holds is given by $B_{t+1}^i := \frac{\phi_t^i - \mu}{1-\mu} w_t^i L_t$. From the last and from $1-\tau^i = \alpha\left(1-\beta^i\right)$, we have:

$$\left(\phi_t^1 - \mu\right)\left(1-\beta^1\right) z_t^1 + \left(\phi_t^2 - \mu\right)\left(1-\beta^2\right) z_t^2 = 0. \tag{19}$$

It follows from $\phi_t^1 < \phi_t^2$ and Eq. (19) that $\phi_t^1 < \mu < \phi_t^2$ for all $t \geq 0$.[9] Note from Eqs. (15) and (17) that the effects of government corruption are reflected only in the tax on the wage income in a closed economy model, whereas the effects are reflected in both the tax rate and the cutoff, $\phi_t^i$, in the two-country model. The taxation reduces the return on investment and financial capital flows out of a country with a higher tax rate into a country with a lower tax rate. Now we can compare the growth rates between country 1 and country 2.

**Proposition 1** *Under Assumption 1, suppose that country* 1 *and country* 2 *are identical in terms of the degree of credit constraints, technology, preference, and size of the population, but different in the degree of corruption. Then, the ranking of the growth rates is as follows:*

$$\Gamma_o^1 > \Gamma_c^1 > \Gamma_c^2 > \Gamma_o^2,$$

*where* $\Gamma_o^i$ *and* $\Gamma_c^i$ *are the growth rates in country* $i$ *when it is an open economy and a closed economy, respectively.*

**Proof:** Obviously, we have $\Gamma_c^1 > \Gamma_c^2$ because $\tau^1 < \tau^2$. It follows from $\phi_t^1 < \mu < \phi_t^2$ and Eq. (15) that $\Gamma_o^1 > \Gamma_c^1$ and $\Gamma_c^2 > \Gamma_o^2$. □

[9] Although we do not analyze the dynamic behavior of $\phi_t^i$, it suffices to know that $\phi_t^1 < \mu < \phi_t^2$ when comparing growth rates.

# 4 Discussion

While $\Gamma_o^1$ and $\Gamma_o^2$ in Proposition 1 are time-variant, the ranking of the growth rates does not change. Proposition 1 generically implies that capital account liberalization is beneficial to a less corrupt country relative to other countries, whereas it is unfavorable to a highly corrupt country. The differences in the growth rates between the two countries are magnified by capital account liberalization.

The equilibrium interest rate in a less corrupt country is greater than the one in a highly corrupt county when each is a closed economy. This is because the return on an investment project is greater in the less corrupt country than in the highly corrupt country. Because the growth rate in a closed economy is independent of the interest rate, the negative effect of corruption on economic growth is reflected only in the tax rate on wage income.

Once the two countries are financially integrated, financial capital flows in a country with a high interest rate from a country with a low interest rate, as is well known in international economics, and in equilibrium, both countries face the common world interest rate. The effects of inflow and outflow of financial capital on economic growth are reflected in the equilibrium cutoff, $\phi_t^i$. The number of savers in a highly (less) corrupt country is greater (less) than that in a less (highly) corrupt country. The effects of inflow and outflow of financial capital on economic growth magnify the negative effects of government corruption when the capital account is liberalized. As a result, the difference in the growth rates between the two countries is enlarged.

# 5 Empirical Evidence

We have theoretically demonstrated that capital account liberalization is beneficial to less corrupt countries but is disadvantageous to highly corrupt countries. In this section, we empirically verify this proposition.

## 5.1 Data

The data were drawn from various databases. Depending upon the availability of the dataset, we assembled the annual data for 111 countries over the period from 1985-2009. Countries in our sample are listed in Table A1 in Appendix A.2. We averaged each variable for five years, following the procedure employed by the literature on growth regressions (see for instance Levine et al., 2000). Accordingly, we created the dataset for the following non-overlapping five periods: 1985-1989, 1990-1994, 1995-1999, 2000-2004, and 2005-2009. The use of five-year averaged data enables us to mitigate noises associated with short-run economic fluctuations.

The growth rates of per capita real gross domestic product (GDP) were calculated by using per capita real GDP obtained from the World Development Indicators by World Bank (2010b). The capital account openness index developed by Chinn and Ito (2006, 2008) is used for the measure of capital account liberalization (henceforth, we call this "financial openness"). The Chinn-Ito index is a *de jure* measure of capital account openness, which reflects the intensity of capital controls and the nature of capital control policies. The values of the Chinn-Ito index range from $-1.8312$ to 2.5000, with larger values indicating greater capital account liberalization.[10] It is difficult to measure corruption because corruption is illegal and no one reports that he/she engages in corruption. We use the corruption index created by the Political Risk Services Group (PRS Group, 2011), which publishes the *International Country Risk Guide.* This corruption index is a perception-based, subjective index that reflects an assessment of corruption within the political system. While the original index ranges from 0 (most corrupt) to 6 (least corrupt), we rescaled this index from 0 (least corrupt) to 6 (most corrupt) so that we can interpret the index more easily.

We incorporate various control variables used in the growth regression literature in our estimation. We include the natural logarithm of the initial real GDP per capita to control

[10]Because the Chinn-Ito index is available until 2008, we averaged the index from 2005-2008 for the last period.

for the stage of economic development. The initial real GDP per capita was taken from the World Development Indicators by World Bank (2010b).

We also include education, the private credit/GDP ratio, and investment. Education is a proxy for human capital, which is measured by the average years of total schooling of the population over age 15, developed by Barro and Lee (2010). The private credit/GDP ratio is often used as a proxy for financial development in the literature on finance and growth.[11] The private credit/GDP ratio was obtained from Beck et al. (2010), which is entitled "private credit by deposit money banks and other financial institutions to GDP" in their database. The data for investment were assembled from the "investment share of GDP per capita" in the Penn World Table (Heston et al., 2011). For robustness checks, we also control for trade, inflation, population growth, government expenditure, and life expectancy, all of which were obtained from the World Development Indicators created by World Bank (2010b). The detailed definitions and data sources are provided in Table A2 in Appendix A.2. The descriptive statistics of all variables are shown in Table A3 in Appendix A.2.

## 5.2 Estimation Method

When examining the effects that corruption and its interaction with financial openness have on economic growth, we must care about the reverse causality from economic growth to corruption. For instance, if the growth rate is low, the salary of the government officials might be very low because of the low tax revenue. In that case, the government officials have greater incentives to accept bribes, and thus corruption will be more prevalent in such an economy. To control for such simultaneity bias, we conduct a dynamic panel data analysis with country-specific fixed effects.

Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) develop the linear generalized method of moments (GMM) estimators for dynamic panel models. In our analysis, we specifically use the system GMM estimators.[12] We estimate the

[11] See Levine (2005).

[12] See Arellano and Bover (1995) and Blundell and Bond (1998) for the moment conditions.

following equation:

$$\begin{aligned} y_{i,t} - y_{i,t-1} &= (\alpha_1 - 1)\, y_{i,t-1} + \alpha_2 \text{Financial openness}_{i,t} \\ &\quad + \alpha_3 \text{Financial openness}_{i,t} \times \text{Corruption}_{i,t} + X_{i,t}\beta + \mu_t + \eta_i + u_{i,t}. \end{aligned}$$

where $i$ and $t$ represent a country and time, respectively. $\mu$ is a time-specific effect, $\eta$ is a country-specific effect, and $u$ is an error term. $y$ is the logarithm of per capita real GDP. Other than the endogeneity of corruption, we have good reason to use the system GMM because $y_{i,t-1}$ is not strictly exogenous but is predetermined. Note that we can regard $y_{i,t} - y_{i,t-1}$ as the average growth rate within the $t$th period. $X$ is the set of control variables including a constant. Our theory predicts that $\alpha_3$ is negative because financial globalization leads to a decrease in the growth rate of a highly corrupt country, whereas $\alpha_2$ is positive because financial globalization leads to an increase in the growth rate of a less corrupt country.

To obtain consistent estimates, we must address the validity of the instruments. Therefore, we consider two specification tests. The first test examines the hypothesis that the error terms are not serially correlated, and for that purpose we test whether the differenced error terms are serially correlated with respect to the second order.[13] The second test is the Hansen test of over-identifying restrictions, which tests the orthogonality conditions of the instruments.

We must also care about small sample bias associated with an estimate of the variance-covariance matrix because the number of countries in our dataset is, at most, 111, and thus our sample size is limited. In the second-step estimation when performing the two-step system GMM, the residuals from the first-step estimation are used to produce a consistent estimate of the variance-covariance matrix; however, the obtained estimate of the variance-covariance matrix is severely downward biased if the sample size is small. Windmeijer (2005) develops corrected standard errors to correct such a small sample bias. We report

[13] Because we examine the differenced error terms, the examination of the first order serial correlation makes no sense.

Windmeijer's (2005) corrected standard errors in our estimation results when performing the two-step system GMM.

Given the size of our sample, we must also consider the number of moment restrictions because if we use too many instruments, the system GMM estimators are unable to eliminate endogenous components. Moreover, too many instruments also reduce the power of the Hansen test of over-identifying restrictions (See Bowsher, 2002; Roodman, 2009; and Ziliak, 1997). Therefore, we use only the two-to-three-period lagged variables as instrumental variables.

## 5.3 Results

Table 1 presents the estimation results without the interaction term between financial openness and corruption as a benchmark. In columns (2) through (5), we report the results of the system GMM, and in column (1), we report the result of the OLS estimation, which may be biased due to reverse causality and/or omitted variables.

[Table 1 here]

All of the regressions including the OLS estimation show the insignificance of the coefficient of corruption, although all the signs of the coefficients except for that of column (2) are negative. The coefficients of financial openness are negative in columns (2) through (5), and they are significant in columns (2) and (3). Both human capital and investment significantly and positively enter into all estimations as they do in the literature on empirical growth (e.g., Barro, 1991). However, a somewhat surprising result is that private credit, which is a proxy for financial development, has a significantly negative impact on economic growth. This result is obtained even though we eliminate investment from our estimations. While this result contradicts the traditional literature on finance and growth (Aghion et al., 2005; Levine, 2005; Levine et al., 2000), it is consistent with the empirical results recently obtained by Loayza and Rancière (2006), Saci et al. (2009), and Rousseau and Wachtel (2011).[14]

[14] There is debate on the relationship between finance and growth. The recent evidence shows that the

To investigate the validity of instrumental variables in columns (2) through (5), we perform the Hansen test of over-identifying restrictions. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level for all the estimations in columns (2) through (5). For the system GMM estimator to be consistent, no serial correlations of the error terms should exist. We examine whether the differenced error terms in columns (2) through (5) are serially correlated with respect to the second order. The *p*-values are so large that the AR(2) tests cannot reject the null hypothesis of no second-order serial correlation.

Table 2 shows our main estimation results, including the interaction term between financial openness and corruption. Both financial openness and the interaction term insignificantly enter into the OLS estimation in column (1). As mentioned above, however, the OLS estimates are probably biased due to the problem of endogeneity. In the system GMM estimations in columns (2) through (5), both the coefficients of financial openness and its interaction with corruption are statistically significant at the conventional significance level. The negative signs of the interaction terms between financial openness and corruption imply that the partial impact of financial openness on economic growth decreases as the degree of corruption increases. For example, column (5) shows that the partial impact of financial openness is given by ($0.0108 - 0.0040 \times$ corruption), which provides the threshold value, 2.702, of corruption that divides countries into those with the positive partial impact and those with the negative partial impact of financial openness on economic growth. In other words, if the degree of corruption is below this threshold, the partial effect of financial openness on economic growth is positive, whereas if the degree of corruption is above this threshold, its partial effect is negative. These results are consistent with our theoretical pre-

development of financial intermediation has a negative impact on growth in the short run and a positive impact in the long run (Loayza and Rancière, 2006). Because each data point of our dataset was created by averaging the original data points for only five years, the short-run effect of financial development on economic growth probably dominates the long-run effect. There is also evidence indicating that the development of financial intermediation has a negative impact on growth if the data points are extended until quite recently (Rousseau and Wachtel, 2011). Therefore, revisiting the empirical claims on the relationship between finance and growth should be necessary for future research.

dictions. Note that the coefficients of corruption in all regressions are insignificant. Hence, we eliminate this variable in Table 3.

[Table 2 here]

While Table 3 presents almost the same results as those in Table 2, we find that the significance levels of the interaction terms in columns (2) through (5) are 1%, which are better than in Table 2. The significance levels of financial openness in columns (2) through (5) are 5%, which are also better than in Table 2. The absolute values of the coefficients of financial openness and their interactions with corruption are stable in all estimations in Tables 2 and 3. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level, and the tests for serial correlations do not reject the null hypothesis of no second-order serial correlation in all estimations.

[Table 3 here]

For robustness checks, we control for various variables that have been considered as important determinants of economic growth in previous studies (e.g., Levine and Renelt, 1992). Tables 4 and 5 provide the results with and without controlling for corruption, respectively. Except for the case in which inflation is controlled for, all the results of financial openness and its interaction term with corruption are the same as those in the previous estimations even though we control for trade openness, population growth, government expenditure, and life expectancy.[15] The Hansen tests of over-identifying restrictions and the serial correlation tests show the validity of instrumental variables in all estimations.

[Table 4 here]

[Table 5 here]

[15]In column (2) in Table 4, while the coefficient of financial openness is not significant, the coefficient of its interaction with corruption is significantly negative as our theory predicts. In addition, in column (2) in Table 5, the coefficient of the interaction term between financial openness and corruption is significant at the 11% significance level.

# 6 Concluding Remarks

We have investigated how the interaction of capital account liberalization and government corruption affects economic growth both theoretically and empirically. Our theoretical results are as follows. Highly corrupt countries tend to impose higher tax rates than do less corrupt countries, and thus, the negative impacts of government corruption on economic growth are magnified in the highly corrupt countries if countries liberalize their capital account. On the other hand, the negative impacts of government corruption are reduced in the less corrupt countries if countries liberalize their capital account because of the inflow of financial capital from the highly corrupt countries. As a result, the least corrupt, financially open countries experience the highest growth rates; the least corrupt, financially closed countries experience the second highest growth rates; the highly corrupt, financially closed countries experience the third highest growth rates; and the highly corrupt, financially open countries experience the lowest growth rates. Empirical evidence obtained from an analysis of the panel data collected from 111 countries is supportive of our theoretical predictions.

Our contributions are novel in the literature both on corruption and growth and on financial globalization and its effects on economies in that we have studied the interactive effects of capital account liberalization and government corruption on economic growth. We believe that our research contributes to the recent policy debates on the merits or demerits of capital account liberalization.

# Appendix

## A.1. Microfoundations for Credit Constraints

We describe two types of microfoundations for a credit constraint in this Appendix.

### Microfoundation I

We follow the model settings of Aghion et al. (1999), Aghion and Banerjee (2005), and Aghion et al. (2005) to provide a microfoundation.

When borrowing, each agent is endowed with his/her own wealth $w_t$, which is wages earned when he/she is young. Therefore, his/her total resources to invest are $k_t = w_t - d_t$. As seen in the main text, $q_{t+1}\phi$ is the return on one unit of investment. If a borrower faithfully repays his/her obligations, he/she earns a net income, $q_{t+1}\phi k_t + r_{t+1}d_t$. On the other hand, if the borrower does not repay his/her obligations, he/she has to incur a cost, $\delta k_t$, to conceal his/her revenue. If this happens, a financial intermediary monitors the borrower and captures him/her with probability $p_{t+1}$. Hence, if he/she decides to default, he/she obtains the expected income, $q_{t+1}\phi k_t - \delta k_t + p_{t+1}r_{t+1}d_t$.

The incentive compatibility constraint under this lending contract, which leads the borrower not to default, is as follows:

$$q_{t+1}\phi k_t + r_{t+1}d_t \geq \left[q_{t+1}\phi - \delta\right] k_t + p_{t+1}r_{t+1}d_t, \tag{A.1}$$

which is rewritten as:

$$d_t \geq -\frac{\delta}{r_{t+1}\left(1 - p_{t+1}\right)} k_t, \tag{A.2}$$

The borrower acquires the revenue given in the left-hand side of Eq. (A.1) when he/she starts a project and faithfully repays his/her obligations. The borrower's gain when he/she defaults is given in the right-hand side. Note that Eq. (A.2) is independent of the return on one unit of investment.

The financial intermediary selects the optimal probability $p_{t+1}$ to detect the borrower's deception; however, it incurs an effort cost, $d_t\Phi(p_{t+1})$, so as to attain the optimal probability. The effort cost is increasing and convex with respect to $p_{t+1}$. As in Aghion and Banerjee (2005), we assume $\Phi(p_{t+1}) = \kappa \log(1 - p_{t+1})$, where $\kappa$ is strictly greater than $\delta$ such that all borrowers face credit constraints more severe than their natural debt limits. The financial intermediary solves the following maximization problem:

$$\max_{p_{t+1}} \; - p_{t+1}r_{t+1}d_t - \kappa \log\left(1 - p_{t+1}\right) d_t.$$

Because $-d_t > 0$, this maximization problem is equivalent to:

$$\max_{p_{t+1}} \; p_{t+1}r_{t+1} + \kappa \log\left(1 - p_{t+1}\right).$$

From the first-order condition, we have:

$$r_{t+1} = \frac{\kappa}{1 - p_{t+1}}. \tag{A.3}$$

The increase in the interest rate $r_{t+1}$ leads to the high probability of detecting defaulting borrowers. From Eqs. (A.2) and (A.3), we obtain:

$$d_t \geq -\frac{\delta}{\kappa} k_t,$$

or equivalently,

$$d_t \geq -\frac{\delta}{\kappa - \delta} w_t. \tag{A.4}$$

Although the financial intermediary does not impose agent-specific credit constraints because the agent's productivity $\phi$ is unobservable, it must know the agent's wealth, $w_t$. None will default in equilibrium providing the financial intermediary imposes a credit constraint given by the inequality (A.4) on all agents. Because $\delta < \kappa$, we can let $\nu := \delta / (\kappa - \delta) \in [0, \infty)$, and thus:

$$d_t \geq -\nu w_t.$$

This is a credit constraint in the main text. $\delta$ and $\kappa$ are respectively associated with a default cost and a monitoring cost. As $\delta$ increases or $\kappa$ decreases, a financial market is considered to be fully developed.

**Microfoundation II**

Antràs and Caballero (2009) develop a microfoundation for a credit constraint. We extend their microfoundation in a manner suitable for our model. We consider the participation constraint faced by the financial intermediary and the incentive compatibility constraint of the borrowers which leads them not to default.

At the end of the first period of each borrower's lifetime and after investment has occurred, any borrower can walk away without carrying out his/her investment project. He/she takes some fraction of his/her investment with no cost, $(1 - \mu)(w_t - d_t)$, where $0 < \mu < 1$ without repaying his/her obligations to the financial intermediary. In this case, the borrower will be engaged in real capital production somewhere and sell the real capital in a market.

If a borrower absconds at the end of the first period, the financial intermediary can withdraw the remainder of the investment, $\mu\left(w_t - d_t\right)$. We assume that the financial intermediary can relend the remainder of the investment in the financial market. This implies that when making a financial contract with a borrower, the financial intermediary faces a participation constraint such that:

$$r_{t+1}\mu\left(w_t - d_t\right) \geq -r_{t+1}d_t,$$

or equivalently,

$$d_t \geq -\frac{\mu}{1-\mu}w_t.$$

The incentive compatibility constraint for a borrower, which leads him/her not to abscond from engaging in his/her project, is given by:

$$\phi q_{t+1}\left(w_t - d_t\right) + r_{t+1}d_t \geq \phi q_{t+1}\left(1-\mu\right)\left(w_t - d_t\right). \tag{A.5}$$

Eq. (A.5) always holds for agents with $\phi$ such that $r_{t+1} - \mu\phi q_{t+1} \leq 0$. Hence, we focus on agents with $\phi$ such that $r_{t+1} - \mu\phi q_{t+1} > 0$. Then, Eq. (A.5) becomes:

$$d_t \geq -\frac{\mu}{\left(\phi_t/\phi\right) - \mu}w. \tag{A.6}$$

Because it follows that $\phi_t/\phi \leq 1$ in equilibrium, we obtain $-\mu/\left(\left(\phi_t/\phi\right) - \mu\right) \leq -\mu/\left(1-\mu\right)$, which implies that Eq. (A.6) is redundant.

In sum, borrowers never default if the financial intermediary imposes a credit constraint $d_t \geq -\mu w_t/\left(1-\mu\right)$, which is the participation constraint of the financial intermediary. Letting $\mu/\left(1-\mu\right) := \nu$, we have the credit constraint $b_t \geq -\nu w_t$ as shown in the main text.

As $\mu$ or $\nu$ increases, it becomes more difficult for the borrowers to withdraw their investment without repaying their obligations. If we consider these variables as being associated with the legal protection of the lenders, a financial market fully develops as the variables increase.

## A.2. Data Description

[Table A1 here]

[Table A2 here]

[Table A3 here]

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Table 1: Financial openness, corruption, and economic growth

| | (1) OLS | (2) System GMM | (3) System GMM | (4) System GMM | (5) System GMM |
|---|---|---|---|---|---|
| Logarithm of initial | -0.0025* | -0.0013 | -0.0022 | -0.0028 | -0.0062 |
| GDP per capita | (0.0014) | (0.0051) | (0.0066) | (0.0048) | (0.0050) |
| Financial Openness | 0.0006 | -0.0038* | -0.0024 | -0.0040* | -0.0022 |
| | (0.0008) | (0.0022) | (0.0021) | (0.0023) | (0.0024) |
| Corruption | -0.0009 | 0.0003 | -0.0006 | -0.0029 | -0.0056 |
| | (0.0013) | (0.0024) | (0.0025) | (0.0036) | (0.0041) |
| Education | 0.0030*** | 0.0093*** | 0.0096*** | 0.0089*** | 0.0088*** |
| | (0.0006) | (0.0022) | (0.0023) | (0.0023) | (0.0025) |
| Private Credit | -0.0117*** | -0.0186** | -0.0238** | -0.0221*** | -0.0255*** |
| | (0.0029) | (0.0080) | (0.0094) | (0.0078) | (0.0078) |
| Investment | 0.0822*** | 0.1436*** | 0.1418*** | 0.1809*** | 0.1915*** |
| | (0.0183) | (0.0398) | (0.0422) | (0.0432) | (0.0514) |
| Constant | 0.0025 | -0.0588 | -0.0469 | -0.0441 | -0.0090 |
| | (0.0115) | (0.0357) | (0.0460) | (0.0362) | (0.0390) |
| Year dummies | Yes | No | No | Yes | Yes |
| | | One-step | Two-step | One-step | Two-step |
| No. of instruments | | 41 | 41 | 45 | 45 |
| AR (2) test | | $p$=0.93 | $p$=0.93 | $p$=0.90 | $p$=0.78 |
| Hansen test | | $p$=0.20 | $p$=0.20 | $p$=0.18 | $p$=0.18 |
| No. of countries | 111 | 111 | 111 | 111 | 111 |
| Observations | 497 | 497 | 497 | 497 | 497 |

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors. In particular, in the "Two-Step" estimations, Windmeijer's (2005) corrected standard errors are provided. All the regressions, including the OLS estimation, show the insignificance of the coefficient of corruption. The coefficients of financial openness are negative in columns (2) through (5), and they are significant in columns (2) and (3)."$p =$" is the p-value of a statistical test. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level for all estimations. We test whether the differenced error terms are serially correlated with respect to the second order. The $p$-values are so large that the AR(2) tests do not reject the null hypothesis of no second-order serial correlation.

Table 2: The interaction effects of financial openness and corruption on economic growth

| | (1) OLS | (2) System GMM | (3) System GMM | (4) System GMM | (5) System GMM |
|---|---|---|---|---|---|
| Logarithm of initial | -0.0025* | -0.0030 | -0.0048 | -0.0040 | -0.0070 |
| GDP per capita | (0.0014) | (0.0051) | (0.0069) | (0.0048) | (0.0048) |
| Financial Openness | 0.0009 | 0.0081* | 0.0086* | 0.0085* | 0.0108** |
| | (0.0016) | (0.0049) | (0.0043) | (0.0050) | (0.0047) |
| Corruption | -0.0008 | 0.0013 | 0.0012 | -0.0004 | -0.0003 |
| | (0.0014) | (0.0023) | (0.0024) | (0.0034) | (0.0033) |
| Financial Openness | -0.0001 | -0.0036** | -0.0036*** | -0.0035** | -0.0040*** |
| ×Corruption | (0.0005) | (0.0015) | (0.0014) | (0.0015) | (0.0014) |
| Education | 0.0031*** | 0.0091*** | 0.0098*** | 0.0088*** | 0.0096*** |
| | (0.0006) | (0.0022) | (0.0025) | (0.0024) | (0.0024) |
| Private Credit | -0.0119*** | -0.0224*** | -0.0250*** | -0.0252*** | -0.0274*** |
| | (0.0030) | (0.0079) | (0.0078) | (0.0078) | (0.0070) |
| Investment | 0.0826*** | 0.1667*** | 0.1503*** | 0.1960*** | 0.1907*** |
| | (0.0185) | (0.0392) | (0.0370) | (0.0422) | (0.0421) |
| Constant | 0.0021 | -0.0531 | -0.0371 | -0.0446 | -0.0214 |
| | (0.0120) | (0.0372) | (0.0479) | (0.0355) | (0.0372) |
| Year dummies | Yes | No | No | Yes | Yes |
| | | One-step | Two-step | One-step | Two-step |
| No. of instruments | | 47 | 47 | 51 | 51 |
| AR (2) test | | $p$=0.95 | $p$=0.97 | $p$=0.90 | $p$=0.91 |
| Hansen test | | $p$=0.36 | $p$=0.36 | $p$=0.37 | $p$=0.37 |
| No. of countries | 111 | 111 | 111 | 111 | 111 |
| Observations | 497 | 497 | 497 | 497 | 497 |

Notes: The interaction term between financial openness and corruption is incorporated in the estimations. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors. In particular, in the "Two-Step" estimations, Windmeijer's (2005) corrected standard errors are provided. The OLS estimates are probably biased due to the problem of endogeneity. In the system GMM estimations, both coefficients of financial openness and its interaction with corruption are statistically significant at the conventional significance level. The negative signs of the interaction terms between financial openness and corruption imply that the partial impact of financial openness on economic growth decreases as the degree of corruption increases. "$p =$" is the p-value of a statistical test. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level for all estimations. We test whether the differenced error terms are serially correlated with respect to the second order. The $p$-values are so large that the AR(2) tests do not reject the null hypothesis of no second-order serial correlation.

Table 3: The interaction effects of financial openness and corruption on economic growth without a corruption term

| | (1) OLS | (2) System GMM | (3) System GMM | (4) System GMM | (5) System GMM |
|---|---|---|---|---|---|
| Logarithm of initial | -0.0023* | -0.0009 | -0.0054 | 0.0006 | -0.0046 |
| GDP per capita | (0.0013) | (0.0045) | (0.0060) | (0.0049) | (0.0044) |
| Financial Openness | 0.0013 | 0.0109** | 0.0104** | 0.0100** | 0.0105** |
| | (0.0014) | (0.0050) | (0.0051) | (0.0050) | (0.0046) |
| Financial Openness | -0.0002 | -0.0043*** | -0.0039** | -0.0042*** | -0.0043*** |
| ×Corruption | (0.0005) | (0.0015) | (0.0015) | (0.0016) | (0.0015) |
| Education | 0.0031*** | 0.0089*** | 0.0094*** | 0.0086*** | 0.0093*** |
| | (0.0006) | (0.0023) | (0.0025) | (0.0027) | (0.0026) |
| Private Credit | -0.0114*** | -0.0296*** | -0.0269*** | -0.0324*** | -0.0326*** |
| | (0.0030) | (0.0089) | (0.0085) | (0.0084) | (0.0063) |
| Investment | 0.0821*** | 0.1956*** | 0.1779*** | 0.2099*** | 0.2257*** |
| | (0.0184) | (0.0434) | (0.0420) | (0.0444) | (0.0395) |
| Constant | -0.0022 | -0.0678** | -0.0322 | -0.0804** | -0.0452 |
| | (0.0087) | (0.0318) | (0.0389) | (0.0311) | (0.0297) |
| Year dummies | Yes | No | No | Yes | Yes |
| | | One-step | Two-step | One-step | Two-step |
| No. of instruments | | 41 | 41 | 45 | 45 |
| AR (2) test | | $p$=0.98 | $p$=0.99 | $p$=0.92 | $p$=0.89 |
| Hansen test | | $p$=0.48 | $p$=0.48 | $p$=0.59 | $p$=0.59 |
| No. of countries | 111 | 111 | 111 | 111 | 111 |
| Observations | 497 | 497 | 497 | 497 | 497 |

Notes: The interaction term between financial openness and corruption is incorporated in the estimations, but the "Corruption" term is eliminated because of its insignificance in estimations in Table 2. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors. In particular, in the "Two-Step" estimations, Windmeijer's (2005) corrected standard errors are provided. The estimation results are similar to those of Table 2. "$p =$" is the p-value of a statistical test. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level for all estimations. We test whether the differenced error terms are serially correlated with respect to the second order. The $p$-values are so large that the AR(2) tests do not reject the null hypothesis of no second-order serial correlation.

Table 4: Robustness analysis on the interaction effects of financial openness and corruption on economic growth

| | (1)<br>System<br>GMM | (2)<br>System<br>GMM | (3)<br>System<br>GMM | (4)<br>System<br>GMM | (5)<br>System<br>GMM |
|---|---|---|---|---|---|
| Logarithm of initial | -0.0023 | -0.0049 | -0.0088 | -0.0015 | -0.0102 |
| GDP per capita | (0.0047) | (0.0047) | (0.0053) | (0.0066) | (0.0067) |
| Financial Openness | 0.0099** | 0.0074 | 0.0134*** | 0.0103** | 0.0113** |
| | (0.0041) | (0.0054) | (0.0046) | (0.0041) | (0.0046) |
| Corruption | 0.0004 | 0.0018 | -0.0036 | 0.0026 | -0.0002 |
| | (0.0033) | (0.0037) | (0.0033) | (0.0037) | (0.0029) |
| Financial Openness | -0.0038*** | -0.0032* | -0.0049*** | -0.0038*** | -0.0043*** |
| ×Corruption | (0.0014) | (0.0017) | (0.0014) | (0.0013) | (0.0015) |
| Education | 0.0077*** | 0.0117*** | 0.0102*** | 0.0063 | 0.0079*** |
| | (0.0023) | (0.0023) | (0.0023) | (0.0041) | (0.0023) |
| Private Credit | -0.0314*** | -0.0278*** | -0.0255*** | -0.0277*** | -0.0277*** |
| | (0.0074) | (0.0074) | (0.0070) | (0.0068) | (0.0081) |
| Investment | 0.1746*** | 0.1518*** | 0.1757*** | 0.2124*** | 0.1842*** |
| | (0.0372) | (0.0508) | (0.0384) | (0.0393) | (0.0378) |
| Trade | 0.0073 | | | | |
| | (0.0066) | | | | |
| Inflation | | -0.0016 | | | |
| | | (0.0045) | | | |
| Population Growth | | | -0.1330 | | |
| | | | (0.0968) | | |
| Government Expenditure | | | | -0.3392 | |
| | | | | (0.5539) | |
| Life Expectancy | | | | | 0.0015** |
| | | | | | (0.0006) |
| Constant | -0.0485 | -0.0492 | 0.0206 | -0.0495 | -0.0815* |
| | (0.0347) | (0.0369) | (0.0328) | (0.0366) | (0.0419) |
| Year dummies | Yes | Yes | Yes | Yes | Yes |
| | Two-step | Two-step | Two-step | Two-step | Two-step |
| No. of instruments | 57 | 57 | 57 | 57 | 57 |
| AR (2) test | $p$=1.00 | $p$=0.70 | $p$=0.90 | $p$=0.99 | $p$=0.97 |
| Hansen test | $p$=0.50 | $p$=0.34 | $p$=0.58 | $p$=0.34 | $p$=0.27 |
| No. of countries | 111 | 111 | 111 | 111 | 111 |
| Observations | 492 | 488 | 496 | 497 | 497 |

Notes: We add various control variables to the estimations in Table 2. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors. In particular, in the "Two-Step" estimations, Windmeijer's (2005) corrected standard errors are provided. The estimation results are similar to those of Table 2. "$p$ =" is the p-value of a statistical test. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level for all estimations. We test whether the differenced error terms are serially correlated with respect to the second order. The $p$-values are so large that the AR(2) tests do not reject the null hypothesis of no second-order serial correlation.

Table 5: Robustness analysis on the interaction effects of financial openness and corruption on economic growth without a corruption term

| | (1)<br>System<br>GMM | (2)<br>System<br>GMM | (3)<br>System<br>GMM | (4)<br>System<br>GMM | (5)<br>System<br>GMM |
|---|---|---|---|---|---|
| Logarithm of initial | -0.0027 | -0.0037 | -0.0038 | -0.0001 | -0.0046 |
| GDP per capita | (0.0048) | (0.0045) | (0.0053) | (0.0058) | (0.0062) |
| Financial Openness | 0.0124*** | 0.0069 | 0.0127*** | 0.0106** | 0.0116** |
| | (0.0039) | (0.0060) | (0.0047) | (0.0044) | (0.0045) |
| Financial Openness | -0.0043*** | -0.0033 | -0.0049*** | -0.0041*** | -0.0046*** |
| $\times$Corruption | (0.0013) | (0.0020) | (0.0016) | (0.0015) | (0.0016) |
| Education | 0.0066** | 0.0124*** | 0.0091*** | 0.0059 | 0.0074*** |
| | (0.0026) | (0.0025) | (0.0023) | (0.0037) | (0.0023) |
| Private Credit | -0.0327*** | -0.0332*** | -0.0267*** | -0.0374*** | -0.0338*** |
| | (0.0069) | (0.0075) | (0.0057) | (0.0068) | (0.0084) |
| Investment | 0.2081*** | 0.1740*** | 0.1743*** | 0.2633*** | 0.2091*** |
| | (0.0450) | (0.0525) | (0.0468) | (0.0360) | (0.0435) |
| Trade | 0.0080 | | | | |
| | (0.0068) | | | | |
| Inflation | | 0.0003 | | | |
| | | (0.0032) | | | |
| Population Growth | | | -0.1104 | | |
| | | | (0.0985) | | |
| Government Expenditure | | | | -0.1600 | |
| | | | | (0.3232) | |
| Life Expectancy | | | | | 0.0011 |
| | | | | | (0.0008) |
| Constant | -0.0448 | -0.0621** | -0.0242 | -0.0622** | -0.1018*** |
| | (0.0302) | (0.0312) | (0.0252) | (0.0301) | (0.0349) |
| Year dummies | Yes | Yes | Yes | Yes | Yes |
| | Two-step | Two-step | Two-step | Two-step | Two-step |
| No. of instruments | 51 | 51 | 51 | 51 | 51 |
| AR (2) test | $p$=0.97 | $p$=0.81 | $p$=0.92 | $p$=0.88 | $p$=0.99 |
| Hansen test | $p$=0.70 | $p$=0.22 | $p$=0.54 | $p$=0.46 | $p$=0.28 |
| No. of countries | 111 | 111 | 111 | 111 | 111 |
| Observations | 492 | 488 | 496 | 497 | 497 |

Notes: We add various control variables to the estimations in Table 3. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors. In particular, in the "Two-Step" estimations, Windmeijer's (2005) corrected standard errors are provided. The estimation results are similar to those of Table 3. "$p =$" is the p-value of a statistical test. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level for all estimations. We test whether the differenced error terms are serially correlated with respect to the second order. The $p$-values are so large that the AR(2) tests do not reject the null hypothesis of no second-order serial correlation.

Table A1: List of countries

| | | | | |
|---|---|---|---|---|
| Albania | Dominican Rep. | Jamaica | Papua New Guinea | Trinidad and Tobago |
| Algeria | Ecuador | Japan | Paraguay | Tunisia |
| Argentina | Egypt | Jordan | Peru | Turkey |
| Armenia | El Salvador | Kazakhstan | Philippines | Uganda |
| Australia | Estonia | Kenya | Poland | United Kingdom |
| Austria | Finland | Korea, Rep. | Portugal | United States |
| Bahrain | France | Kuwait | Qatar | Uruguay |
| Bangladesh | Gabon | Latvia | Romania | Venezuela |
| Belgium | Gambia | Libya | Russia | Vietnam |
| Bolivia | Germany | Lithuania | Saudi Arabia | Yemen |
| Botswana | Ghana | Malawi | Senegal | Zambia |
| Brazil | Greece | Malaysia | Sierra Leone | |
| Bulgaria | Guatemala | Mali | Singapore | |
| Cameroon | Guyana | Malta | Slovak Rep. | |
| Canada | Haiti | Mexico | Slovenia | |
| Chile | Honduras | Moldova | South Africa | |
| Colombia | Hong Kong | Mongolia | Spain | |
| Congo, Dem. Rep. | Hungary | Morocco | Sri Lanka | |
| Congo, Rep. | Iceland | Mozambique | Sudan | |
| Costa Rica | India | Netherlands | Sweden | |
| Cote d'Ivoire | Indonesia | New Zealand | Switzerland | |
| Croatia | Iran | Niger | Syria | |
| Cyprus | Ireland | Norway | Tanzania | |
| Czech Republic | Israel | Pakistan | Thailand | |
| Denmark | Italy | Panama | Togo | |

Table A2: Data definitions and sources

| Variable | Description | Source |
|---|---|---|
| Growth | Growth rate of real GDP per capita. | World Bank (2010b) |
| Logarithm of initial GDP per capita | The natural logarithm of real GDP per capita in an initial year. | World Bank (2010b) |
| Financial Openness | The extent of capital account liberalization. | Chinn and Ito (2006, 2008) |
| Corruption | Assessment of corruption within the political system. | PRS Group (2011) |
| Education | Average years of total schooling of the population over age 15. | World Bank (2010a) (Original source: Barro and Lee, 2010) |
| Private Credit | Private credit by deposit money banks and other financial institutions divided by GDP. | Beck et al. (2010) |
| Investment | Investment share of real GDP per capita. | Heston et al. (2011) |
| Trade | The sum of exports and imports of goods and services divided by GDP. | World Bank (2010b) |
| Inflation | Inflation computed from the consumer price index. | World Bank (2010b) |
| Population Growth | Population growth rate. | World Bank (2011b) |
| Government Expenditure | General government final consumption expenditures divided by GDP. | World Bank (2010b) |
| Life Expectancy | Life expectancy at birth of both male and female. | World Bank (2010b) |

Table A3: Descriptive statistics

| Variables | Observations | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Growth | 535 | 0.0161 | 0.0323 | -0.2236 | 0.1026 |
| Logarithm of initial GDP per capita | 534 | 7.8843 | 1.5692 | 4.4392 | 10.6120 |
| Financial Openness | 523 | 0.4558 | 1.5673 | -1.8312 | 2.5000 |
| Corruption | 534 | 2.8609 | 1.3063 | 0 | 6 |
| Education | 555 | 7.1031 | 2.7592 | 0.4849 | 13.0221 |
| Private Credit | 518 | 0.4875 | 0.4368 | 0.0040 | 2.3356 |
| Investment | 545 | 0.2236 | 0.0807 | -0.0226 | 0.5478 |
| Trade | 534 | 0.7881 | 0.4798 | 0.1342 | 4.2363 |
| Inflation | 526 | 0.5732 | 3.8438 | -0.1910 | 64.2499 |
| Population Growth | 555 | 0.0145 | 0.0159 | -0.2036 | 0.1140 |
| Government Expenditure | 540 | 0.1551 | 0.0568 | 0.0408 | 0.4806 |
| Life Expectancy | 555 | 68.0593 | 9.6858 | 38.9262 | 82.3354 |

Notes: These statistics are calculated based on five-year averaged data of 111 countries listed in Table A1 in Appendix A.2.