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 the economic growth of a country 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 highly corrupt countries and reducing the impacts in less corrupt countries if capital account liberalization is enacted. Empirical evidence obtained from an analysis of panel data collected from 109 countries is consistent with our theoretical predictions. Our theoretical and empirical results contribute to the recent policy debates on the merits and demerits of capital account liberalization.

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1 Introduction

The question whether government corruption impedes economic growth and development has been long investigated by many researchers both empirically and theoretically. Acemoglu and Verdier [1], de Vaal and Ebben [23], Ehrlich and Lui [25], Mauro [42], and Shleifer and Vishny [54] among others have theoretically demonstrated that government corruption is harmful to economic growth and development.[1] Similarly, since the pioneering work of Mauro [41], many researchers, such as Ehrlich and Lui [25], Glaeser and Saks [28], and Mo [44] have empirically presented evidence indicating that government corruption hinders economic growth and development.[2] As pointed out by Weil [58], corrupt officials may waste public funds by, for instance, awarding contracts to the private agents who pay the largest bribes, rather than to those who are the most efficient, or by putting the taxes collected directly into their own pockets. Corruption takes many forms, such as bribes paid to government officials by tax-payers, trading of official contracts for cash, and embezzlement of public funds.[3] The World Bank has estimated that the corruption costs incurred by the entire world economy amounts to more than one trillion dollars a year.[4] As such, it is now widely accepted that government corruption is a serious obstacle to economic growth and development. Motivated by the extant literature on corruption and growth, we investigate whether capital account liberalization magnifies or reduces the negative impact of corruption on a country's economic growth.

This study is not the first one to investigate how the combination of financial openness and government corruption affects the economic growth of a country. Neeman et al. [45] find empirically

[1] Yano [63] emphasizes that high quality markets are essential to the healthy growth of an economy. Government corruption is one of the typical factors that reduce market quality.

[2] Moreover, Wei [56,57] studied the effects of corruption on foreign direct investment (FDI) and found that corruption is a significant obstacle to FDI.

[3] The World Bank [60,61] has identified the root causes of corruption.

[4] See the News & Broadcast article 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 amount of one trillion dollars does not include the embezzlement of public funds or theft of public assets. Daniel Kaufmann, the World Bank Institute's former director for Governance and Anti-Corruption, says, "It is important to emphasize that this is not simply a developing country problem. Fighting corruption is a global challenge."

that government corruption has a negative effect on the level of gross domestic product (GDP) in highly open countries but has almost no effect in highly closed countries. They use the black market premium as the measure of financial openness. In contrast, we use both *de jure* and *de facto* measures of financial openness in our estimations. More specifically, we use the capital account openness index developed by Chinn and Ito [20,21] as the *de jure* measure of financial openness. This index reflects the intensity of capital controls and nature of capital policies. Following Kose et al. [32,33], we also use the sum of total assets and total liabilities divided by the GDP as the *de facto* measure of financial openness. We compute the sum of total assets and total liabilities from the dataset created by Lane and Milesi-Ferretti [35]. Neeman et al. [45] also present a theoretical model that explains how government corruption hinders production. However, they do not explicitly model an open economy. In contrast, we explicitly consider financial openness in our model. We incorporate the behavior of a corrupt government into our model as did Mauro [42] and de Vaal and Ebben [23]. However, unlike Mauro [42] and de Vaal and Ebben [23], we study a two-country model in which the two countries differ in the degree of corruption.

We theoretically find that if government corruption is less prevalent in a country, capital account liberalization leads to a higher growth rate, and if government corruption is highly prevalent, capital account liberalization leads to a lower growth rate. In other words, capital account liberalization magnifies the negative effect of government corruption on economic growth in highly corrupt countries, whereas capital account liberalization reduces the negative effect of government corruption on economic growth in less corrupt countries. These findings, obtained by using our two-country model, are novel theoretical contributions to the literature on corruption and growth. The mechanism behind these results is as follows. If a country is financially closed to the world market, government corruption only causes a higher tax rate on labor income, and the magnitude of government corruption on the country's economic growth is thus relatively limited. However, if two countries are financially integrated, one highly corrupt and the other less corrupt, the negative effect of taxation on an investment project is higher in the highly corrupt country than in the less corrupt country. Consequently, financial capital flows into the less corrupt country from the 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 are magnified in the highly corrupt country but reduced in the less corrupt country.

These theoretical consequences support the existing empirical evidence indicating that weak institutional circumstances in poor countries are obstacles to capital inflow from rich countries and may even induce capital flight from the poor countries (e.g., Alfaro et al. [6]; Wei [56,57]). According to standard neo-classical growth models, financial globalization generates economic advantages for all the countries participating in the international financial market, because rich countries gain new investment opportunities in poor countries and, in turn, poor countries, where the 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 the neo-classical growth models predict (Lucas [40]; Obstfeld and Taylor [46]; Stulz [55]). The volume of capital that moved to poor countries in the recent years is a very small proportion of the total capital flow in the international financial market (Mishkin [43]). Under the circumstances in which government corruption is prevalent, as in the economy of our theoretical model, if a country opens its financial market to the world market, it is highly likely that capital will flow out and the country's economic growth will be significantly dampened, more so than when the country is a closed economy. In this sense, our theoretical model also contributes to the literature on the Lucas paradox.

The effect of financial globalization on economic growth has been extensively investigated by many researchers empirically (e.g., Chanda [19]; Eichengreen and Leblang [26]; Quinn [48]; Quinn and Toyoda [49]; Rodrik [50]). However, it still remains unclear whether financial globalization is beneficial to all countries, as these studies produced many pieces of mixed evidence.[5] While Bekaert et al. [16], Kraay [34], and Quinn and Toyoda [49] find no evidence that capital account liberalization positively affects the economic growth of a country even though it has a high level of institutional quality, Arteta et al. [10], Durham [24], and Klein [30] find supportive evidence for its positive effects, although the result is not very robust and depends upon the specifications and sample period. Along the same lines as these studies, we analyze a panel data from 109 countries and examine whether capital account liberalization amplifies or mitigates the negative effect of government corruption on the economic growth and development of a country. We obtain empirical evidence consistent with our theoretical findings; that is, capital account liberalization is beneficial to less corrupt countries but is disadvantageous to highly corrupt countries.

The remainder of this paper proceeds as follows. In the next section, we develop a model explaining 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 in the case of both closed and open economies. In section 4, we discuss 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. In section 6, we present our concluding remarks.

2 Model

The economy in our model 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 ∞. Each individual born at time t exclusively obtains utility from her second-period consumption c_{t+1}. Because she is risk neutral, the utility function of an individual is given by $u(c_{t+1}) := c_{t+1}$.[6] The population

[5] See Kose et al. [32,33] for a comprehensive survey of the literature on financial globalization.

[6] Even if we assume that individuals consume in both the first and second periods of their lifetimes, the essence of the model does not change, although the investigation becomes complicated. In particular, if we use a Cobb-Douglas

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 representative firm's production of for time $t+1$.
- Production at time $t+1$ occurs, and the government collects corporate tax from the representative firm. Individuals receive their returns on investment and lending. They repay their obligations if they borrowed at time t. Individuals consume the whole of their income.

As will be addressed later, the government's choice variables are the 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 that these private individuals misappropriate public funds through abuses.[7] In this sense, the government is sub-benevolent because its decisions are biased toward the individuals colluding 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 the old agents at time t nor the young agents at time $t+1$ are involved in the decision making political process regarding time $t+1$. The government commits to its policy decisions made at the end of time t with regard to time $t+1$.

utility function or a log-linear utility function, the main result is identical to the one derived from the model in the main text.

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

2.1 Production Sector

The final goods of an economy are produced from real capital and labor. Following Barro [11] and Futagami et al. [27], we incorporate public capital into the production function. Specifically, the production function is given in a Cobb-Douglas form as follows:

$$Y_t = AZ_t^{\alpha}\left[(1-\theta_t)\, g_t L_t\right]^{1-\alpha}, \quad 0<\alpha<1, \tag{1}$$

where Y_t is the output, L_t the aggregate labor, Z_t the aggregate real capital, and A the technology level of production function.[8] We denote the public spending per young agent by g_t. On account of public-spending leakages due to government corruption, the public capital created from public spending has a less than one-for-one relationship. Specifically, the public capital per young agent is given by $(1-\theta_t)\, g_t$, where $0 < \theta_t < 1$. $\theta_t g_t$ is the wasted resources from the perspective of the production sector. The wasted resources are embezzled by the individuals colluding with the government. In other words, θ_t can be thought of as the misappropriation share of public funds, determined in accordance with the government's collective decision.[9] Both the real capital and public capital depreciate entirely in one period.

Since the government imposes a corporate tax on the final product, the representative firm maximizes its net profit, $(1-\tau_t)\, Y_t - w_t L_t - q_t Z_t$, where τ_t is the tax rate on the final product, w_t the wage rate, and q_t 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 a Stackelberg follower. Given the misappropriation rate, θ_t, and the tax rate, τ_t, the production factors in competitive markets are paid their respective marginal products as

[8] A is a certain positive constant. The technology level should be large enough to ensure positive growth as in the traditional AK model.

[9] So far, θ measures the inefficiency of the provision of public capital. In our model, θ is determined endogenously by the extent of government corruption.

follows:

$$q_t = \alpha (1-\tau_t) Y_t/Z_t \tag{2}$$

$$w_t = (1-\alpha)(1-\tau_t) Y_t/L_t. \tag{3}$$

2.2 Individuals

Each individual faces budget constraints in the first period and second period, respectively, as follows:

$$k_t + d_t \leq w_t, \tag{4}$$

and

$$c_{t+1} \leq q_{t+1}\phi k_t + r_{t+1} d_t, \tag{5}$$

where k_t is the investment in a project and d_t lending when positive and borrowing when negative. If an individual starts an investment project when young, she produces real capital ϕk_t in the second period, which is sold to the representative firm at price q_{t+1}, and ϕ is the productivity of the real capital production. If the individual lends financial capital in the first period, she receives a gross return of r_{t+1} in the second period. If she borrows financial capital in the first period, she pays a gross interest rate of r_{t+1} in the second period, the same rate as lending.

Because of agency problems in the financial market, investors face borrowing constraints. Following Aghion et al. [4], the credit constraint facing each individual is given by

$$d_t \geq -\nu w_t, \tag{6}$$

where $\nu \in [0, \infty)$ measures the degree of credit constraints. We note that individuals can borrow financial capital up to ν times w_t; w_t can be considered a down-payment for the investment project. In Appendix A.1, we provide two kinds of microfoundations for Eq. (6).[10] The non-negativity

[10] 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 the credit constraint (6). This type of assumption for credit market imperfections is often imposed in the literature (e.g., Aghion and Banerjee [2]; Aghion et al. [3]; Aghion et al. [4]). Even if we replace the inequality (6) with $b_t \geq -\mu k_t$, where $\mu \in [0, 1)$, this alternative credit constraint is equivalent to the inequality (6), and the same results will be obtained.

constraint for the investment project is given by

$$k_t \geq 0. \tag{7}$$

Now, we introduce the heterogeneity of individuals with respect to the productivity of real capital creation. Specifically, the productivity ϕ varies between individuals and is distributed uniformly over $[0,1]$. Each individual knows her own productivity at birth but does not know the productivity of any other individuals. As we will see later, owing to the heterogeneity of individuals' talents and the credit constraints facing them, two financially integrated countries can experience sustainable growth, even though there may be a difference in the equilibrium interest rates when each country is a closed economy.[11]

Each individual maximizes c_{t+1} subject to inequalities (4)-(7). 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 $r_{t+1} - \phi q_{t+1} < 0$, it is optimal for her to choose $d_t = -\frac{\mu w_t}{1-\mu}$ and $k_t = \frac{w_t}{1-\mu}$. Formally, we obtain the following lemma:

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

- *If $\phi_t > \phi$, then $k_t = 0$ and $d_t = w_t$.*
- *If $\phi_t < \phi$, then $k_t = \frac{w_t}{1-\mu}$ and $d_t = -\frac{\mu w_t}{1-\mu}$.*

[11] Our model is comparable to the AK model. In the standard AK model, if two countries having different equilibrium interest rates are financially integrated, sustainable growth cannot be achieved in the country having the lower interest rate. In our model, however, sustainable growth can be achieved in both the financially integrated countries owing to the heterogeneity of individuals' talents and the credit constraints.

Lemma 1 implies that each individual chooses to either start an investment project or lend her funds to investors, depending upon her entrepreneurial talent. It should be noted that ϕ_t is the cutoff that divides agents into savers and borrowers.

2.3 Government's Behavior

The government runs a balanced budget, given by

$$g_{t+1}L_{t+1} = \tau_{t+1}Y_{t+1}. \tag{8}$$

From this equation, we can rewrite the production function (1) as follows:

$$Y_{t+1} = A^{1/\alpha}\left(1-\theta_{t+1}\right)^{(1-\alpha)/\alpha}\tau_{t+1}^{(1-\alpha)/\alpha}Z_{t+1}. \tag{9}$$

Thus, the equations of capital price (2) and wage (3) can be written respectively as

$$q_{t+1} = \alpha A^{1/\alpha}\left(1-\tau_{t+1}\right)\left(1-\theta_{t+1}\right)^{(1-\alpha)/\alpha}\tau_{t+1}^{(1-\alpha)/\alpha} \tag{10}$$

$$w_{t+1} = \left(1-\alpha\right)A^{1/\alpha}\left(1-\tau_{t+1}\right)\left(1-\theta_{t+1}\right)^{(1-\alpha)/\alpha}\tau_{t+1}^{(1-\alpha)/\alpha}z_{t+1}, \tag{11}$$

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

From Lemma 1, we compute the aggregate real capital supplied by investors as

$$Z_{t+1} = \int_{\phi_t}^{1}\phi k_t L_t d\phi = \frac{w_t\left(1-\left(\phi_t\right)^2\right)}{2\left(1-\mu\right)}L_t. \tag{12}$$

Since $L_{t+1} = L_t$, from Eqs. (11) and (12), we obtain the law of motion of real capital as follows:

$$z_{t+1} = \frac{\left(1-\tau_t\right)\tau_t^{(1-\alpha)/\alpha}\left(1-\alpha\right)A^{1/\alpha}\left(1-\theta_t\right)^{(1-\alpha)/\alpha}\left(1-\left(\phi_t\right)^2\right)}{2\left(1-\mu\right)}z_t. \tag{13}$$

The dynamic behavior 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 γ of the total population in each generation is involved in a political process, and that they misappropriate public funds. Collective decisions on both the tax rate (τ_{t+1}) and the degree of political corruption (θ_{t+1}) are made by agents born at time t and collude with the government. They maximize the geometric average between consumption per capita in the generation and embezzlement of public funds per corrupt agent as follows:

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

where $\bar{c}_{t+1}$ is the consumption per capita in the generation and b_{t+1} the embezzlement per corrupt agent; β is a measure of the degree of political corruption.[12] Note that corrupt individuals must hide their embezzlement to consume it. The embezzlement cannot be included in the budget constraints of Eqs. (4) and (5) because society might detect the individuals' misdoings. Since the government is a Stackelberg leader, it solves its maximization problem by taking into account the representative firm's first-order conditions, namely, Eqs. (10) and (11).

The consumption of individuals with $\phi < \phi_t$ is given by $c_{t+1} = \phi_t q_{t+1} w_t$, and that with $\phi > \phi_{t+1}$ is given by $c_{t+1} = (\phi - \mu\phi_t) q_{t+1} w_t/(1-\mu)$. Therefore, it follows that

$$\bar{c}_{t+1} L_t = \int_0^{\phi_t} \phi_t q_{t+1} w_t L_t d\phi + \int_{\phi_t}^1 \frac{\phi - \mu\phi_t}{1-\mu} q_{t+1} w_t L_t d\phi,$$

or equivalently,

$$\begin{aligned} \frac{\bar{c}_{t+1}}{q_{t+1} w_t} &= \phi_t \int_0^{\phi_t} d\phi + \frac{1}{1-\mu} \int_{\phi_t}^1 (\phi - \mu\phi_t) d\phi, \\ &= \frac{1}{2(1-\mu)} \left((\phi_t)^2 - 2\mu\phi_t + 1 \right). \end{aligned} \tag{14}$$

Moreover, from Eqs. (9) and (12) it follows 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 embezzlement of public funds per corrupt agent, $b_{t+1} = \theta_{t+1} g_{t+1} L_{t+1}/(\gamma L_t)$, is given by

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

Since the choice variables of the collective decisions are τ_{t+1} and θ_{t+1}, and q_{t+1} is given by Eq. (10), the government's maximization problem is converted into two independent maximization problems:

$$\max_{\tau_{t+1}} (1-\tau_{t+1})^{1-\beta} \tau_{t+1}^{\frac{(1-\alpha)(1-\beta)+\beta}{\alpha}}, \tag{15}$$

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

and

$$\max_{\theta_{t+1}} (1 - \theta_{t+1})^{\frac{1-\alpha}{\alpha}} \theta_{t+1}^{\beta}. \tag{16}$$

These two maximization problems are solved as follows:

$$\tau^* := (1 - \alpha)(1 - \beta) + \beta, \tag{17}$$

and

$$\theta^* := \frac{\alpha\beta}{(1 - \alpha)(1 - \beta) + \beta}. \tag{18}$$

These 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 will be equal to $1 - \alpha$, the same rate that Barro [11] derives.

Thus far, only the misappropriation of public funds is considered as government corruption. Because of the misappropriation of public funds, the tax rate becomes higher than the optimal level. However, we also view government corruption from the perspective of bribes. A tax rate of $1 - \alpha$ maximizes per capita consumption. Therefore, we may consider that the representative firm bribes government officials with $[\tau^* - (1 - \alpha)]Y_t = \alpha\beta Y_t$, just as the corrupt officials require the representative firm to do. The representative firm would consider $\alpha\beta Y_t$ as an extra tax payment that would not have been incurred if the government officials had not been corrupt. In other words, the bribes can be considered an implicit tax payment. In this sense, the tax rate of τ^* chosen by the government may not exactly correspond to the tax rate actually observed.

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

$$\bar{q} \;:\; = \alpha A^{1/\alpha} (1 - \alpha)^{(1-\alpha)/\alpha} (1 - \tau^*) \tag{19}$$

$$\bar{w}_t \;:\; = (1 - \alpha)^{1/\alpha} A^{1/\alpha} z_t (1 - \tau^*). \tag{20}$$

Defining the growth rate of an economy as $\Gamma_{t+1} := \frac{z_{t+1}}{z_t}$, from Eq. (13) and $(1 - \theta^*)\tau^* = 1 - \alpha$ we obtain

$$\Gamma_{t+1} := \frac{(1 - \tau^*)(1 - \alpha)^{1/\alpha} A^{1/\alpha} (1 - (\phi_t)^2)}{2(1 - \mu)}. \tag{21}$$

3 Equilibrium Growth Rates

The equilibrium growth rate is derived from Eq. (21) such that the domestic financial market (in a closed economy model) or the world financial market (in a two-country model) clears.

3.1 Closed Economy Model

From Lemma 1, the excess supply of financial capital at time t in the country is given by

$$\begin{aligned} B_t &:= \int_0^{\phi_t} w_t L_t d\phi - \int_{\phi_t}^1 \frac{\mu w_t L_t}{1-\mu} d\phi \\ &= w_t L_t \phi_t - \frac{\mu w_t L_t}{1-\mu}(1-\phi_t) \\ &= \frac{\phi_t - \mu}{1-\mu} w_t L_t. \end{aligned} \tag{22}$$

In a closed economy, the financial market clears within a country. Therefore, the financial market clearing condition is given by $B_t = 0$, or equivalently,

$$\phi_t = \mu. \tag{23}$$

From Eqs. (21) and (23), we obtain the equilibrium growth rate of the closed economy as follows:

$$\Gamma_{t+1} := \frac{(1-\tau^*)(1-\alpha)^{1/\alpha} A^{1/\alpha}(1+\mu)}{2}. \tag{24}$$

Note that the growth rate in a closed economy declines as the corruption parameter, β, increases because of the higher tax rate on wage income.

3.2 Two-Country Model

Suppose that the world economy consists of two countries, 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 degree of credit constraints, technology, and size of population, but not in terms of degree of government corruption. We impose a parameter condition, Assumption 1, shown below.

Assumption 1

$$\mu\left(1-\beta_1\right) \leq 1-\beta_2 < 1-\beta_1,$$

where β_i *($i = 1,2$) is the corruption parameter of country* i.

In the second inequality of Assumption 1, we assume that the degree of corruption in country 1 is less than that of country 2, that is, $\beta_1 < \beta_2$. From Eq. (17), the equilibrium tax rate of country 1 is less than that of country 2, that is, $\tau_1 < \tau_2$, and from Eq. (18), the misappropriation share of public funds of country 1 is less than that of country 2, that is, $\theta_1 < \theta_2$. As will be shown later, the first inequality guarantees that there are always agents who create capital in both countries. In fact, if the degree of credit constraints, μ, is large enough for $\mu\left(1-\beta_1\right) > 1-\beta_2$, then no one will produce real capital in country 2 for a sufficiently large t. We avoid this case for simplicity.

Since the two countries are financially integrated, they face a common world interest rate. Thus, it holds that $r_{t+1} = \bar{q}_1\phi_{1,t} = \bar{q}_2\phi_{2,t}$, where $\bar{q}_i$ is the capital price and $\phi_{i,t}$ the cutoff in country i. From Eq. (19) and $1-\tau_i = \alpha\left(1-\beta_i\right)$, we can rewrite $\bar{q}_1\phi_{1,t} = \bar{q}_2\phi_{2,t}$ as

$$\left(1-\beta_1\right)\phi_{1,t} = \left(1-\beta_2\right)\phi_{2,t}. \tag{25}$$

From $\beta_1 < \beta_2$ it follows that $\phi_{1,t} < \phi_{2,t}$, implying that when the two countries are financially integrated, the number of savers (borrowers) is greater (smaller) in country 2 than in country 1.

From Eq. (22), the net foreign assets at time t in country i, which is the excess supply of financial capital from the perspective of the domestic market, is given by $B_{i,t} = \frac{\phi_{i,t}-\mu}{1-\mu} w_{i,t} L_t$. The international financial market clears over the two countries, and it must hold that $B_{1,t} + B_{2,t} = 0$, and thus $\phi_{1,t} < \mu < \phi_{2,t}$ for all $t \geq 0$.[13] $B_{1,t} < 0$ and $B_{2,t} > 0$ indicate that country 1 is always a net borrower and country 2 is always a net lender in the international financial market. Note that in each time period, country 1 borrows resources from country 2, and in the next period it pays off its interest-bearing debt to country 2. In contrast, in each time period, country 2 lends resources to

[13] Although we do not analyze the dynamic behavior of $\phi_{i,t}$, it suffices for us to know that $\phi_{1,t} < \mu < \phi_{2,t}$ when the growth rates are compared.

country 1, and in the next period it obtains the proceeds of investment in country 1, being repaid by country 1.

From $B_{1,t}+B_{2,t}=0$, $1-\tau_i=\alpha\left(1-\beta_i\right)$, and Eq. (20), we obtain

$$\left(\phi_{1,t}-\mu\right)\left(1-\beta_1\right)z_{1,t}+\left(\phi_{2,t}-\mu\right)\left(1-\beta_2\right)z_{2,t}=0. \tag{26}$$

From Eqs. (25) and (26), we obtain the cutoffs of the two countries as follows:

$$\phi_{1,t}=\mu+\frac{\mu(\beta_1-\beta_2)z_{2,t}}{(1-\beta_1)(z_{1,t}+z_{2,t})} \tag{27}$$

and

$$\phi_{2,t}=\mu+\frac{\mu(\beta_2-\beta_1)z_{1,t}}{(1-\beta_2)(z_{1,t}+z_{2,t})}. \tag{28}$$

Because $\phi_{2,t}<\mu+\mu(\beta_2-\beta_1)/(1-\beta_2)$ from Eq. (28), it follows from Assumption 1 that $\phi_{2,t}<1$ for all $t\geq 0$, implying that there are always agents who create capital in both countries.[14]

From $\beta_1<\beta_2$ and Eqs. (27) and (28), we can confirm that $\phi_{1,t}<\mu<\phi_{2,t}$ for all $t\geq 0$ again. Note that from Eqs. (21) and (24) the effects of government corruption on the country's economic growth are reflected only in the tax on wage income in the closed economy model, whereas the effects are reflected in both the tax rate and the cutoff, $\phi_{i,t}$, in the two-country model. The taxation reduces the return on investment, and financial capital flows out from a country with a higher tax rate to a country with a lower tax rate. We can now compare the growth rates of country 1 and country 2.

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

$$\Gamma_{1,o}>\Gamma_{1,c}>\Gamma_{2,c}>\Gamma_{2,o},$$

where $\Gamma_{i,o}$ is the growth rate when country i is an open economy and $\Gamma_{i,c}$ is the growth rate when country i is a closed economy.

[14] Since $\phi_{1,t}<\phi_{2,t}$ holds in equilibrium, $\phi_{1,t}<1$ is guaranteed.

Proof: If both countries are closed economies, it follows from Eq. (24) that $\Gamma_{1,c} > \Gamma_{2,c}$ because $\tau_1 < \tau_2$. If both countries are open economies, it follows from $\phi_{1,t} < \mu < \phi_{2,t}$ and Eq. (21) that $\Gamma_{1,o} > \Gamma_{1,c}$ and $\Gamma_{2,c} > \Gamma_{2,o}$. $\square$

Later, in section 5, we empirically examine Proposition 1. In a two-country model, however, the gross domestic product (GDP) does not correspond to the gross national product (GNP). Specifically, because country 1 is a net borrower and country 2 a net lender in the international financial market, country 1's GNP is less than its GDP, whereas country 2's GNP is greater than its GDP. It is therefore important to investigate the welfare effect of corruption on each country. In our model, the aggregate welfare of the agents born at time t is equal to the aggregate consumption at time $t+1$. Using Eqs. (14), (19), and (20), we can compute the aggregate welfare of the agents born at time t in country i as

$$\begin{aligned} U_{i,t}(\phi_{i,t}, z_{i,t}) &:= \bar{c}_{i,t+1} L_t \\ &= \Psi \times [(\phi_{i,t} - \mu)^2 + 1 - \mu^2] z_{i,t}, \end{aligned} \tag{29}$$

where $\Psi := \alpha(1-\alpha)^{(2-\alpha)/\alpha} A^{2/\alpha}(1-\tau_i)^2 L_t/[2(1-\mu)]$, which is constant throughout the time periods. Note that from Eq. (29) the total welfare of the agents born at time t is a function of the cutoff $\phi_{i,t}$ and capital $z_{i,t}$ at time t. Regarding country 1, from $\Gamma_{1,o} > \Gamma_{1,c}$ and $\phi_{1,t} < \mu$ in the two-country model, it follows that the total welfare of country 1 is greater for all $t \geq 0$ when it is an *open* economy than when it is a *closed* economy. On the other hand, the total welfare of the agents born *at time 0* in country 2 is greater when the country is an *open* economy than when it is a *closed* economy because $z_{2,0}$ is pre-determined and $\phi_{2,t} > \mu$ in the two-country model. However, the growth rate difference between a closed, more corrupt economy and an open, more corrupt economy has a significant long-run impact on the welfare difference between them. Because $\phi_{2,t}$ is bounded above, that is, $\phi_{2,t} < \mu + \mu(\beta_2 - \beta_1)/(1-\beta_2)$ for all $t \geq 0$ and because $\Gamma_{2,c} > \Gamma_{2,o}$, there exists time $T > 0$ such that the total welfare of all generations from time T onward is greater when country 2 is a *closed* economy than when it is an *open* economy.

One may think that the result regarding country 2 is counterintuitive because the return from lending is greater when country 2 is an open economy than when it is a closed economy with agents in country 2 acquiring a new lending opportunity in the international financial market when the two economies are integrated. We obtain the outcome regarding country 2 because the wage income of the country comes from domestic production, regardless of the country being a closed economy or an open economy. Agents in the current overlapping generations model with financial frictions cannot optimally smooth their consumption nor efficiently allocate resources taking into account future generations' welfare, consuming all their second period income that yields from lending. Under these circumstances, the wage income in the first period, or equivalently, domestic production has a dominant effect on the welfare in each generation in the long run.[15]

Our model predicts that if country 1 and country 2 are integrated, the aggregate welfare in country 1 increases for all generations compared with the case of a closed economy. In contrast, the aggregate welfare in country 2 decreases for all generations except for a few early generations. It is beyond the scope of this paper to minutely investigate how each country decides whether it opens its financial market to the world because this issue must be related to the political process in each country with heterogeneous agents, which could be independent of or affected by corrupt agents. Nevertheless, let us do a thought experiment on country 2. Imagine that the political process in country 2 to determine whether its financial market should be opened to the world is not affected by corrupt agents and that the country makes a very myopic decision considering only the initial generation's aggregate welfare. Then, country 2 tends to open the financial market to the world because the initial generation as a whole is better off. However, if the country keeps the financial market open to the world, the welfare of future generations will be significantly damaged. Ironically, once country 2 opens the financial market to the world, it will keep the financial market open with

[15] Generally speaking, in overlapping generations models and even in infinitely lived-agent models with financial frictions, agents would not be able to allocate resources efficiently to maximize future welfare. The interested reader is referred to Aiyagari and McGrattan [5] and Cozzi [22] regarding a similarity between overlapping generations models and infinitely lived-agent models with financial frictions.

the political process being very myopic in each time period, because $z_{2,t}$ is pre-determined when the political process at time t makes the decision.[16]

4 Discussion

While $\Gamma_{1,o}$ and $\Gamma_{2,o}$ in Proposition 1 are time-variant, the ranking of the growth rates does not change. Proposition 1 generically implies that the differences in growth rates between the two countries are magnified by capital account liberalization. Capital account liberalization is beneficial to a less corrupt country relative to other countries, but it is unfavorable to a highly corrupt country in the sense that the welfare of all the future generations except for a few early generations is reduced.

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

Once the two countries are financially integrated, financial capital will flow from a country with a low interest rate to a country with a high interest rate, as is well known in international economics, and in equilibrium, both the countries will face the common world interest rate. The effects of inflow and outflow of financial capital on the economic growth of the two countries will be reflected in the equilibrium cutoff, $\phi_{i,t}$. 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

[16] In addition to this preliminary thought experiment, there are various possible political situations to be considered when determining whether the financial market should be opened to the world because the agents in our model are heterogeneous both within a generation and across generations. The investigation into how various political situations affect the determination of financial openness could be a topic for a future research.

enlarged.

One might argue that the government of a highly corrupt country can impose a tax on the net foreign assets held by its domestic agents and/or the profits from the net foreign assets, and thereby correct the distortion created by taxation on the domestic product, and that capital account liberalization would thus still be beneficial to the country. In reality, however, introducing such an international taxation regime would be difficult because the private agents of a country may take an international tax avoidance strategy.[17] To avoid being taxed, multinationals often resort to transfer pricing, tax havens, money laundering, treaty shopping, and thin capitalization.[18] For example, by analyzing the income shifting through transfer pricing in a large selection of OECD countries, Bartelsman and Beetsma [14] conclude that more than 65% of the marginal revenue arising from a country's tax increase is lost due to income shifting.[19]

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 for this study are drawn from various databases. Depending upon the availability of datasets, we collect the annual data of 109 countries over the period 1985-2009. The countries in our sample are listed in Table A4 of Appendix A.3. We averaged each variable for five years, following the procedure used in the literature on growth regressions (see for instance Levine et al.,

[17] It is beyond the scope of this paper to discuss the international tax avoidance strategy. See chapter 3 in Kobetsky [31] for shortcomings of international taxation.

[18] Treaty shopping means that by establishing a subsidiary in some country, firms utilize the country's treaties on international double taxation in order to reduce their tax burdens. Thin capitalization means that firms raise the share of debt financing in high tax countries to deduct interest payments from the corporate tax base.

[19] See also Bloomberg's article at http://bloom.bg/SQGG5G on December 10, 2012. According to this article, big multinationals significantly avoided being taxed in 2011 and the European Union incurred a loss of more than one trillion US dollars in tax avoidance in one year.

2000). Accordingly, we create our 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 the noises associated with short-run economic fluctuations.

The per capita real GDP growth rates for our dataset are calculated by using the per capita real GDP obtained from the World Development Indicators of the World Bank [62]. We use two types of indicators for financial openness, both of which must be associated with capital account liberalization. The first is the capital account openness index developed by Chinn and Ito [20,21]. The Chinn-Ito index is a *de jure* measure of capital account openness, reflecting the intensity of capital controls and nature of capital control policies (henceforth, we call this "*de jure* financial openness"). The Chinn-Ito index values range from -1.8556 to 2.4557, with the larger values indicating greater capital account liberalization. Following Kose et al. [32,33], we also consider the sum of total assets and total liabilities divided by GDP as the measure of financial openness. As discussed in Kose et al. [32,33], this indicator is a *de facto* measure of capital account openness (henceforth, we call this "*de facto* financial openness"). This indicator was computed from the dataset for total assets and liabilities created by Lane and Milesei-Ferretti [35].[20] It is not easy to measure corruption, because corruption is illegal and no one will report to have engaged in corruption. We use the corruption index created by the PRS Group [47], which publishes the *International Country Risk Guide*. This corruption index is perception based and subjective, and assesses the corruption taking place within the political system. While the original index ranges from most corrupt (0) to least corrupt (6) in an index scale, we rescaled this index to range from least corrupt (0) to most corrupt (6) to enable us to 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 initial real GDP per capita to control for the stage of economic development. The initial real GDP per capita are taken from the World Development

[20] The data points in the dataset created by Lane and Milesi-Ferretti [35] are available only up to 2007, so we averaged the indicators from 2005 to 2007 for the last period.

Indicators of the World Bank [62]. We also include education, the private credit/GDP ratio, and investment. Education is a proxy for human capital, measured by the average years of total schooling of the population aged over 15 years, developed by Barro and Lee [13]. The private credit/GDP ratio is often used as a proxy for financial development in the literature on finance and growth.[21] The private credit/GDP ratio data are taken from Beck et al. [15], entitled "private credit by deposit money banks and other financial institutions to GDP" in their database. The data for investment are collected from the "investment share of GDP per capita" in the Penn World Table (Heston et al. [29]). Although in our theoretical model investment induces the growth rate, as seen in Eq. (12), reflecting various growth determinants such as government corruption, credit constraints, and the total factor productivity, there may be other channels through which investment affects a country's growth rate. To capture the effects of investment that do not appear in our theoretical model, we incorporate investment as a control variable. For robustness checks, we also control for trade, inflation, government expenditures, population growth, and life expectancy, data of all of which are obtained from the World Development Indicators of the World Bank [62]. The detailed definitions and data sources are provided in Table A5 of Appendix A.3, and the descriptive statistics of all the variables used are shown in Table A6 of Appendix A.3.

5.2 Estimation Method

When examining the effects that financial openness and its interaction with corruption have on the economic growth of a country, we must address the endogeneity problem associated with reverse causality from economic growth to explanatory variables. For instance, if the growth rate is low, the salary of government officials might be very low due to low tax revenue. In this case, the government officials will have greater incentives to accept bribes, and corruption will be more prevalent in such an economy. Financial openness also seems to be an endogenous variable because as an economy develops, the government is more likely to open the financial market to the world. To control

[21] See Levine [36].

for such simultaneity bias, we conduct a dynamic panel data analysis with country-specific fixed effects.[22]

Arellano and Bond [8], Arellano and Bover [9], and Blundell and Bond [17] develop the linear generalized method of moments (GMM) estimators for dynamic panel models. In our analysis, we specifically use the system GMM estimators.[23] We estimate the following equation:

$$\begin{aligned} y_{i,t} - y_{i,t-1} \;=\; & (\alpha_1 - 1)\, y_{i,t-1} + \alpha_2 \text{Financial openness}_{i,t} + \alpha_3 \text{Corruption}_{i,t} \\ & + \alpha_4 \text{Financial openness}_{i,t} \times \text{Corruption}_{i,t} + X_{i,t}\beta + \epsilon_t + \eta_i + u_{i,t}, \qquad (30) \end{aligned}$$

where i and t represent a country and time, respectively. ϵ is a time-specific effect, η is a country-specific effect, and u is an error term. y is the logarithm of per capita real GDP. Other than the endogenous variables discussed above, we have good reason to use the system GMM because $y_{i,t-1}$ is not strictly exogenous but pre-determined. Note that we can regard $y_{i,t} - y_{i,t-1}$ as the average growth rate in the tth period. X is the set of control variables including a constant. Our theory predicts that α_4 is negative because financial globalization leads to a decrease in the growth rate of a highly corrupt country, whereas α_2 is positive because financial globalization leads to an increase in the growth rate of a less corrupt country.

To obtain consistent estimates, we need to address the validity of the instruments and therefore we consider two specification tests. The first test examines the hypothesis that the error terms are not serially correlated; for this, we test whether the differenced error terms are serially correlated with respect to the second order.[24] The second test is the Hansen test of over-identifying restrictions; this tests the orthogonality conditions of the instruments.

We must also address the small sample bias associated with estimating the variance-covariance

[22] Another possible estimation strategy is to perform simple cross-country regressions with instrumental variables. However, in our estimations, we have too many endogenous variables, including financial openness, government corruption, their interaction term, and private credit, to perform simple cross-country regressions. Since it is very difficult to identify external instrumental variables to mitigate the endogeneity problems associated with all these endogenous variables, we conduct a dynamic panel data analysis in this study.

[23] See Arellano and Bover [9] and Blundell and Bond [17] for the moment conditions.

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

matrix because the number of countries in our dataset is at most 109, 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 estimate of variance-covariance matrix obtained will be severely downward-biased if the sample size is small. Windmeijer [59] has developed corrected standard errors to correct such a small sample bias. We report Windmeijer's [59] corrected standard errors in our estimation results.

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 would be unable to eliminate endogenous components. Moreover, the use of too many instruments would reduce the power of the Hansen test of over-identifying restrictions (See Bowsher [18]; Roodman [51]; and Ziliak [64]). Therefore, we use only two-to-three-period lagged variables as instrumental variables.

5.3 Results

Columns (1) and (2) in Table 1 present the estimation results without the interaction term between financial openness and corruption as a benchmark. In columns (1) and (2), we use the *de jure* financial openness and the *de facto* financial openness, respectively.

[Table 1 here]

The coefficients of financial openness are negative in both columns (1) and (2), although they are not significant. Both education and investment are significant and positive in both estimations, just as they are in the literature on empirical growth (e.g., Barro [12]). However, a somewhat surprising result is that private credit, a proxy for financial development, has a significant negative impact on economic growth.[25] While this result contradicts the traditional literature on finance and growth (Aghion et al. [4]; Levine [36]; Levine et al. [37]), it is consistent with the empirical results recently

[25] This result is obtained even if we eliminate investment from our estimations.

obtained by Loayza and Rancière [39], Rousseau and Wachtel [52], and Saci et al. [53].[26]

To investigate the validity of the instrumental variables in columns (1) and (2), we perform the Hansen test of over-identifying restrictions. The Hansen test does not reject the orthogonality conditions at the conventional significance level in the estimation in column (1). However, the Hansen test does reject the orthogonality conditions for the estimation in column (2) at the 10% significance level. The instrumental variables in column (2) may not be valid. 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 (1) and (2) are serially correlated with respect to the second order (the AR (2) test). The p-values in both estimations are so large that the AR (2) tests cannot reject the null hypothesis of no second-order serial correlation of the error terms.

Columns (3) and (4) in Table 1 present our main estimation results, including the interaction term between financial openness and corruption. In column (3), we use the *de jure* financial openness, and in column (4), we use the *de facto* financial openness. In both columns (3) and (4), the coefficients of both financial openness and its interaction with corruption are statistically significant at the conventional significance level. The signs of the coefficients of financial openness are positive, and the signs of its interaction terms with corruption are negative. In particular, the negative signs of the interaction terms imply that the partial impact of financial openness on economic growth decreases as the degree of corruption increases. For example, in column (3), the partial impact of financial openness is shown as $(0.0144 - 0.0049 \times \text{corruption})$, which provides the threshold value, 2.9388, of corruption that divides countries into those with positive and those with negative partial impacts 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

[26] A debate is going on over the relationship between finance and growth. Recent evidence shows that the 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, [39]). Since each data point of our dataset is 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. Existing evidence also indicates that the development of financial intermediation has a negative impact on growth if the data points are extended until quite recently (Rousseau and Wachtel, [52]). Therefore, a relook into the empirical claims on the relationship between finance and growth has become a necessary task for future research.

if the degree of corruption is above this threshold, its partial effect is negative. This threshold value is an approximate median value in our sample. These results are consistent with our theoretical predictions. Note that the coefficients of corruption in all regressions are insignificant. The coefficients of other control variables are stable compared with the estimations in columns (1) and (2). The Hansen tests do not reject the orthogonality conditions at the conventional significance level in the estimations in columns (3) and (4). The AR (2) tests do not reject the null hypothesis of no second-order serial correlation of the error terms, either.

For robustness checks, we control for various variables that have been considered important determinants of economic growth in previous studies (e.g., Levine and Renelt, [38]). Tables 2 and 3 provide the results with the *de jure* financial openness and the *de facto* financial openness, respectively.

All estimation results in Table 2, where we use the *de jure* financial openness, are robust and similar to that in column (3) in Table 1 in terms of both the magnitudes of all coefficients and their significance, implying that the estimation results in Table 2 are consistent with the theoretical hypothesis that capital account liberalization is beneficial to less corrupt countries but disadvantageous to highly corrupt countries. The Hansen tests for all estimations in Table 2 do not reject the orthogonality conditions at the conventional significance level. The AR(2) tests for all estimations in Table 2 do not reject the null hypothesis of no second-order serial correlation of the error terms.

[Table 2 here]

Comparing the estimation results in Table 3 with that in column (4) in Table 1, we find that the estimation result in column (5) is similar to that in column (4) in Table 1. In columns (1) through (3) in Table 3, although the signs and magnitudes of all the coefficients except for the logarithm of initial GDP per capita are stable, the coefficients of financial openness are not significant. Moreover, the coefficient of the interaction term of financial openness and corruption is not significant in column (2). In the estimation in column (4), the magnitudes of the coefficients of both financial openness and its interaction term with corruption are smaller than in other estimations. The Hansen tests of over-identifying restrictions and the serial correlation tests show the validity of instrumental variables in all estimations except in column (3). In the estimation in column (3), although the AR (2) test does not reject the null hypothesis of no second-order serial correlation of error terms, the Hansen test rejects the orthogonality condition at the 10% significance level.

[Table 3 here]

Although the estimation results in Table 3 are consistent with our theoretical hypothesis in the sense that the signs of the coefficients of financial openness and its interaction term with corruption support the hypothesis, the effects of the *de facto* financial openness on economic growth are likely to be mitigated by such control variables as trade, inflation, government expenditures, and population growth.

There is a caveat to our estimation results although they are consistent with our model's prediction. We applied the system GMM estimators by using two-to-three-period lagged variables, including the lagged corruption index, as instrumental variables. However, government corruption seems to have a long-run impact on economic growth. If government corruption has a long-run impact, the lagged corruption index cannot be a valid instrumental variable because it must be correlated with the differenced error terms and the moment conditions proposed by Arellano and Bond [8], Arellano and Bover [9], and Blundell and Bond [17] do not hold. To examine whether this problem does seriously affect our estimation results, we perform further robustness checks. Specifically, we estimate Eq. (30) by removing all the lagged corruption terms and all the lagged interaction terms between financial openness and corruption from the set of the instrumental variables, still assuming that corruption, financial openness and their interaction term in the right-hand side of Eq. (30) are endogenous variables. As shown in Tables A1, A2, and A3 in Appendix A.2, the estimation results are similar to those in Tables 1, 2 and 3, respectively.

6 Concluding Remarks

We have both theoretically and empirically investigated how the interaction between capital account liberalization and government corruption affects the economic growth of a country. Our theoretical results are as follows. Highly corrupt countries tend to impose higher tax rates than do less corrupt countries, thus magnifying the negative impacts of government corruption on the economic growth of highly corrupt countries if the countries liberalize their capital accounts. On the other hand, the negative impacts of government corruption on the economic growth of less corrupt countries are reduced if the countries liberalize their capital accounts 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 our analysis of panel data collected from 109 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 the economic growth of countries. We believe that our research contributes to the recent policy debates on the merits and 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 and Banerjee [2], Aghion et al. [3], and Aghion et al. [4] to provide a microfoundation.

When borrowing, each agent is endowed with her own wealth w_t, which is wages earned when she is young. Therefore, 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 her obligations, 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 her obligations, she has to incur a cost, δk_t, to conceal her revenue. If this happens, a financial intermediary monitors the borrower and captures her with probability p_{t+1}. Hence, if she decides to default, 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 she starts a project and faithfully repays her obligations. The borrower's gain when 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 [2], we assume $\Phi(p_{t+1}) = \kappa\log(1-p_{t+1})$, where κ is strictly greater than δ 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 ϕ 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 $\nu := \delta / \left(\kappa - \delta\right) \in [0, \infty)$, and thus

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

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

Microfoundation II

Antràs and Caballero [7] 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 her investment project. She takes some fraction of her investment with no cost, $(1-\mu)(w_t - d_t)$, where $0 < \mu < 1$ without repaying 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, $\mu(w_t - d_t)$. 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

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

or equivalently,

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

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

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

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

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

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

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

As μ or ν 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. Further robustness checks

Table A1 shows the estimation results when the specifications are the same as in Table 1, except that we eliminate all the lagged corruption terms and the lagged interaction terms between financial openness and corruption from the set of instrumental variables. Each column in Table A1 shows estimation results very similar to those in Table 1. The AR(2) tests do not reject the null hypothesis of no second-order serial correlation in all estimations. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in the estimations using the *de jure* financial openness in columns (1) and (3), whereas the tests reject the orthogonality conditions in the estimations using the *de facto* financial openness in columns (2) and (4) at the 10% significance level.

[Table A1 here]

In Tables A2 and A3, we carry out estimations with the same specifications as in Tables 2 and 3 respectively, removing all the lagged corruption terms and the lagged interaction terms. All columns in Tables A2 and A3 indicate estimation results very similar to those in Tables 2 and 3, respectively. The AR(2) tests do not reject the null hypothesis of no second-order serial correlation in all estimations. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in all estimations in Table A2, where we use the *de jure* financial openness. As regards the case in which we use the *de facto* financial openness, however, compared with columns (4) and (5) in Table 3, the Hansen tests show significance in columns (4) and (5) in Table A3. Other than these Hansen tests, the coefficients of financial openness and its interaction term with corruption in Table A3 are very close to those in Table 3. By carrying out further robustness checks, we can confirm that there is no endogeneity problem associated with the lagged corruption index that affects our estimation results.

[Table A2 here]

[Table A3 here]

A.3. Data Description

See Tables A4-A6.

[Table A4 here]

[Table A5 here]

[Table A6 here]

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Table 1: Financial openness, corruption, and economic growth

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM
Logarithm of initial	-0.0034	0.0030	-0.0064	0.0021
GDP per capita	(0.0060)	(0.0052)	(0.0063)	(0.0064)
Financial openness (*de jure*)	-0.0016		0.0144***	
	(0.0024)		(0.0047)	
Financial openness (*de facto*)		-0.0001		0.0039*
		(0.0012)		(0.0021)
Corruption	-0.0011	0.0034	0.0012	0.0073
	(0.0045)	(0.0048)	(0.0031)	(0.0060)
Financial openness (*de jure*)			-0.0049***	
× Corruption			(0.0015)	
Financial openness (*de facto*)				-0.0016**
× Corruption				(0.0008)
Education	0.0069***	0.0066**	0.0074***	0.0059**
	(0.0021)	(0.0027)	(0.0024)	(0.0025)
Private credit	-0.0213***	-0.0283***	-0.0225***	-0.0282***
	(0.0081)	(0.0108)	(0.0076)	(0.0099)
Investment	0.1704***	0.1510***	0.1793***	0.1696***
	(0.0382)	(0.0406)	(0.0306)	(0.0365)
Constant	-0.0272	-0.0806*	-0.0170	-0.0828
	(0.0473)	(0.0420)	(0.0441)	(0.0531)
Time dummies	Yes	Yes	Yes	Yes
No. of instruments	45	45	51	51
AR (2) test (p-value)	0.69	0.87	0.87	0.96
Hansen test (p-value)	0.13	0.07	0.42	0.12
Countries	109	109	109	109
Observations	492	498	492	498

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's [59] corrected robust standard errors. Columns (3) and (4) provide our main results, where the coefficients of financial openness are positive and significant and the coefficients of the interaction term between financial openness and corruption are negative and significant. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in the estimations in columns (1), (3), and (4). The AR(2) tests do not reject the null hypothesis of no second-order serial correlation at the conventional significance level in all estimations.

Table 2: Robustness analysis on the interaction effects of the *de jure* financial openness and corruption on economic growth

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM	(5) System GMM
Logarithm of initial	-0.0046	-0.0082	-0.0079*	0.0023	-0.0131*
GDP per capita	(0.0048)	(0.0051)	(0.0046)	(0.0047)	(0.0073)
Financial openness (*de jure*)	0.0114**	0.0126**	0.0156***	0.0109**	0.0150***
	(0.0045)	(0.0052)	(0.0046)	(0.0043)	(0.0047)
Corruption	0.0021	0.0023	-0.0019	0.0051*	0.0005
	(0.0031)	(0.0031)	(0.0034)	(0.0030)	(0.0028)
Financial openness (*de jure*)	-0.0040***	-0.0047***	-0.0051***	-0.0044***	-0.0050***
× Corruption	(0.0014)	(0.0018)	(0.0015)	(0.0014)	(0.0014)
Education	0.0073***	0.0105***	0.0083***	0.0037	0.0074***
	(0.0022)	(0.0020)	(0.0021)	(0.0025)	(0.0021)
Private credit	-0.0226***	-0.0207***	-0.0209***	-0.0252***	-0.0195***
	(0.0068)	(0.0074)	(0.0061)	(0.0076)	(0.0073)
Investment	0.1615***	0.1488***	0.1460***	0.1851***	0.1581***
	(0.0296)	(0.0363)	(0.0343)	(0.0293)	(0.0308)
Trade	0.0000				
	(0.0001)				
Inflation		-0.0002			
		(0.0027)			
Government expenditures			-0.1224		
			(0.0791)		
Population growth				-0.4856	
				(0.3726)	
Life expectancy					0.0012**
					(0.0005)
Constant	-0.0299	-0.0210	0.0230	-0.0632*	-0.0369
	(0.0361)	(0.0381)	(0.0337)	(0.0368)	(0.0433)
Time dummies	Yes	Yes	Yes	Yes	Yes
No. of instruments	57	57	57	57	57
AR (2) test (*p*-value)	0.87	0.91	0.79	0.92	0.94
Hansen test (*p*-value)	0.46	0.37	0.41	0.29	0.25
Countries	109	108	109	109	109
Observations	491	483	492	492	492

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's [59] corrected robust standard errors. We perform robustness checks, adding various control variables to the estimation in column (3) in Table 1. All estimation results are similar to that in column (3) in Table 1. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in all estimations. The AR(2) tests do not reject the null hypothesis of no second-order serial correlation at the conventional significance level in all estimations.

Table 3: Robustness analysis on the interaction effects of the *de facto* financial openness and corruption on economic growth

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM	(5) System GMM
Logarithm of initial	0.0026	-0.0038	0.0010	0.0083	-0.0036
GDP per capita	(0.0063)	(0.0065)	(0.0063)	(0.0054)	(0.0058)
Financial openness (*de facto*)	0.0030	0.0031	0.0036	0.0016	0.0037*
	(0.0023)	(0.0022)	(0.0023)	(0.0022)	(0.0021)
Corruption	0.0063	0.0049	0.0052	0.0070	0.0077
	(0.0055)	(0.0060)	(0.0055)	(0.0052)	(0.0053)
Financial openness (*de facto*)	-0.0014*	-0.0013	-0.0015*	-0.0008	-0.0014*
× Corruption	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Education	0.0058**	0.0090***	0.0070***	0.0014	0.0060***
	(0.0024)	(0.0019)	(0.0024)	(0.0035)	(0.0022)
Private credit	-0.0275***	-0.0241**	-0.0243**	-0.0312***	-0.0266***
	(0.0089)	(0.0103)	(0.0104)	(0.0092)	(0.0090)
Investment	0.1534***	0.1390***	0.1563***	0.1922***	0.1381***
	(0.0409)	(0.0470)	(0.0460)	(0.0419)	(0.0441)
Trade	0.0001				
	(0.0001)				
Inflation		-0.0024			
		(0.0053)			
Government expenditures			-0.1267		
			(0.0882)		
Population growth				-0.6829	
				(0.4690)	
Life expectancy					0.0012**
					(0.0006)
Constant	-0.0828*	-0.0428	-0.0557	-0.0938**	-0.1128***
	(0.0497)	(0.0532)	(0.0538)	(0.0383)	(0.0425)
Time dummies	Yes	Yes	Yes	Yes	Yes
No. of instruments	57	57	57	57	57
AR (2) test (*p*-value)	0.98	0.65	0.83	0.77	0.99
Hansen test (*p*-value)	0.23	0.16	0.07	0.11	0.16
Countries	109	108	109	109	109
Observations	497	489	498	498	498

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's [59] corrected robust standard errors. We perform robustness checks, adding various control variables to the estimation in column (4) in Table 1. The estimation result in column (5) is similar to that in column (4) in Table 1. In all estimations, the signs of the coefficients of financial openness and its interaction term with corruption are the same as that in column (4) in Table 1, although they are sometimes insignificant. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in all estimations except in column (3). The AR(2) tests do not reject the null hypothesis of no second-order serial correlation at the conventional significance level in all estimations.

Table A1: Further robustness checks on financial openness, corruption, and economic growth

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM
Logarithm of initial	0.0001	0.0046	-0.0010	0.0056
GDP per capita	(0.0059)	(0.0063)	(0.0064)	(0.0052)
Financial openness (*de jure*)	-0.0020		0.0139**	
	(0.0023)		(0.0068)	
Financial openness (*de facto*)		-0.0002		0.0056*
		(0.0013)		(0.0031)
Corruption	-0.0043	0.0005	0.0019	0.0049
	(0.0052)	(0.0063)	(0.0058)	(0.0070)
Financial openness (*de jure*)			-0.0054**	
× Corruption			(0.0021)	
Financial openness (*de facto*)				-0.0022**
× Corruption				(0.0010)
Education	0.0065***	0.0059*	0.0073***	0.0057*
	(0.0024)	(0.0033)	(0.0023)	(0.0030)
Private credit	-0.0302***	-0.0374***	-0.0291***	-0.0466***
	(0.0085)	(0.0103)	(0.0095)	(0.0110)
Investment	0.1771***	0.1825***	0.1743***	0.2241***
	(0.0397)	(0.0492)	(0.0380)	(0.0509)
Constant	-0.0408	-0.0837	-0.0580	-0.1070**
	(0.0509)	(0.0541)	(0.0527)	(0.0485)
Time dummies	Yes	Yes	Yes	Yes
No. of instruments	39	39	39	39
AR (2) test (p-value)	0.64	0.79	0.90	0.88
Hansen test (p-value)	0.17	0.09	0.30	0.08
Countries	109	109	109	109
Observations	492	498	492	498

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's [59] corrected robust standard errors. We perform robustness checks with the same specifications as in Table 1 except that we remove all the lagged corruption terms and all the lagged interaction terms between financial openness and corruption from the set of the instrumental variables. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in the estimations in columns (1) and (3). The AR(2) tests do not reject the null hypothesis of no second-order serial correlation at the conventional significance level in all estimations.

Table A2: Further robustness checks on the interaction effects of the *de jure* financial openness and corruption on economic growth

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM	(5) System GMM
Logarithm of initial	-0.0027	-0.0043	-0.0059	0.0058	-0.0083
GDP per capita	(0.0052)	(0.0059)	(0.0049)	(0.0047)	(0.0083)
Financial openness (*de jure*)	0.0117*	0.0146*	0.0172***	0.0124*	0.0137**
	(0.0063)	(0.0075)	(0.0065)	(0.0063)	(0.0063)
Corruption	0.0007	0.0039	-0.0002	0.0051	0.0016
	(0.0054)	(0.0063)	(0.0050)	(0.0054)	(0.0042)
Financial openness (*de jure*)	-0.0043**	-0.0058**	-0.0062***	-0.0049**	-0.0053***
× Corruption	(0.0020)	(0.0027)	(0.0021)	(0.0020)	(0.0019)
Education	0.0067***	0.0106***	0.0086***	0.0041*	0.0075***
	(0.0024)	(0.0021)	(0.0022)	(0.0025)	(0.0020)
Private credit	-0.0277***	-0.0251***	-0.0231***	-0.0309***	-0.0227**
	(0.0088)	(0.0092)	(0.0075)	(0.0089)	(0.0098)
Investment	0.1703***	0.1539***	0.1440***	0.1841***	0.1601***
	(0.0381)	(0.0435)	(0.0391)	(0.0361)	(0.0346)
Trade	0.0001				
	(0.0001)				
Inflation		0.0018			
		(0.0023)			
Government expenditures			-0.1115		
			(0.0880)		
Population growth				-0.3708	
				(0.2868)	
Life expectancy					0.0010
					(0.0007)
Constant	-0.0390	-0.0571	-0.0006	-0.0940**	-0.0676
	(0.0439)	(0.0562)	(0.0449)	(0.0386)	(0.0427)
Time dummies	Yes	Yes	Yes	Yes	Yes
No. of instruments	45	45	45	45	45
AR (2) test (p-value)	0.86	0.98	0.86	0.97	0.94
Hansen test (p-value)	0.29	0.23	0.24	0.22	0.14
Countries	109	108	109	109	109
Observations	491	483	492	492	492

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's [59] corrected robust standard errors. We perform robustness checks with the same specifications as in Table 2 except that we remove all the lagged corruption terms and all the lagged interaction terms between financial openness and corruption from the set of the instrumental variables. All estimation results are similar to those in Table 2. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in all estimations. The AR(2) tests do not reject the null hypothesis of no second-order serial correlation at the conventional significance level in all estimations.

Table A3: Further robustness checks on the interaction effects of the *de facto* financial openness and corruption on economic growth

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM	(5) System GMM
Logarithm of initial	0.0058	0.0008	0.0021	0.0110	0.0030
GDP per capita	(0.0054)	(0.0062)	(0.0073)	(0.0081)	(0.0073)
Financial openness (*de facto*)	0.0042	0.0042	0.0045*	0.0021	0.0041
	(0.0027)	(0.0026)	(0.0025)	(0.0030)	(0.0027)
Corruption	0.0056	0.0036	0.0027	0.0060	0.0059
	(0.0071)	(0.0067)	(0.0070)	(0.0073)	(0.0059)
Financial openness (*de facto*)	-0.0019**	-0.0016	-0.0018**	-0.0009	-0.0017*
× Corruption	(0.0009)	(0.0010)	(0.0009)	(0.0009)	(0.0009)
Education	0.0063**	0.0094***	0.0063**	0.0003	0.0068**
	(0.0031)	(0.0021)	(0.0025)	(0.0043)	(0.0027)
Private credit	-0.0403***	-0.0403***	-0.0349***	-0.0382***	-0.0415***
	(0.0097)	(0.0123)	(0.0107)	(0.0109)	(0.0105)
Investment	0.1762***	0.1754***	0.1825***	0.2391***	0.1918***
	(0.0558)	(0.0627)	(0.0572)	(0.0636)	(0.0493)
Trade	0.0002				
	(0.0002)				
Inflation		-0.0032			
		(0.0055)			
Government expenditures			-0.1022		
			(0.0967)		
Population growth				-0.7308*	
				(0.4399)	
Life expectancy					0.0007
					(0.0007)
Constant	-0.1114**	-0.0806	-0.0583	-0.1119*	-0.1386***
	(0.0478)	(0.0559)	(0.0682)	(0.0582)	(0.0412)
Time dummies	Yes	Yes	Yes	Yes	Yes
No. of instruments	45	45	45	45	45
AR (2) test (p-value)	0.88	0.69	0.80	0.84	0.87
Hansen test (p-value)	0.14	0.13	0.03	0.08	0.07
Countries	109	108	109	109	109
Observations	497	489	498	498	498

Notes: The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are Windmeijer's [59] corrected robust standard errors. We perform robustness checks with the same specifications as in Table 3 except that we remove all the lagged corruption terms and all the lagged interaction terms between financial openness and corruption from the set of the instrumental variables. All estimation results are similar to those in Table 3. The Hansen tests of over-identifying restrictions do not reject the orthogonality conditions at the conventional significance level in the estimations in columns (1) and (2). The AR(2) tests do not reject the null hypothesis of no second-order serial correlation in all estimations.

Table A4: List of countries

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

Table A5: Data definitions and sources

Variable	Description	Source
Growth	Growth rate of real GDP per capita.	World Bank [62]
Logarithm of initial GDP per capita	The natural logarithm of real GDP per capita in an initial year.	World Bank [62]
Financial openness (*de jure*)	The extent of capital account liberalization.	Chinn and Ito [20,21]
Financial openness (*de facto*)	The sum of total assets and total liabilities divided by GDP. The data are available from 1985 to 2007.	Lane and Milesi-Ferretti [35]
Corruption	Assessment of corruption within the political system.	PRS Group [47]
Education	Average years of total schooling of the population over age 15.	Barro and Lee [13]
Private credit	Private credit by deposit money banks and other financial institutions divided by GDP.	Beck et al. [15]
Investment	Investment share of real GDP per capita.	Heston et al. [29]
Trade	The sum of exports and imports of goods and services divided by GDP.	World Bank [62]
Inflation	Inflation computed from the consumer price index.	World Bank [62]
Population growth	Population growth rate.	World Bank [62]
Government expenditures	General government final consumption expenditures divided by GDP.	World Bank [62]
Life expectancy	Life expectancy at birth of both male and female.	World Bank [62]

Table A6: Descriptive statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Growth	527	0.0167	0.0297	-0.1577	0.1025
Logarithm of initial GDP per capita	525	7.9322	1.5428	4.8866	10.6111
Financial openness (*de jure*)	516	0.4402	1.5618	-1.8556	2.4557
Financial openness (*de facto*)	526	2.1631	2.9604	0.2574	25.2437
Corruption	526	2.8283	1.2862	0	6
Education	545	7.1774	2.7735	0.5899	12.9105
Private credit	512	0.4920	0.4372	0.0143	2.3356
Investment	536	0.2243	0.0809	-0.0226	0.5478
Trade	529	39.3455	27.3028	4.4054	225.2719
Inflation	518	0.4474	2.6696	-0.0518	44.4787
Government expenditures	532	0.1565	0.0566	0.0408	0.4806
Population growth	545	0.0152	0.0142	-0.0151	0.1608
Life expectancy	545	68.2784	9.7049	37.8081	82.4546

Notes: These statistics are calculated based on five-year averaged data of 109 countries listed in Table A4 of Appendix A.3.