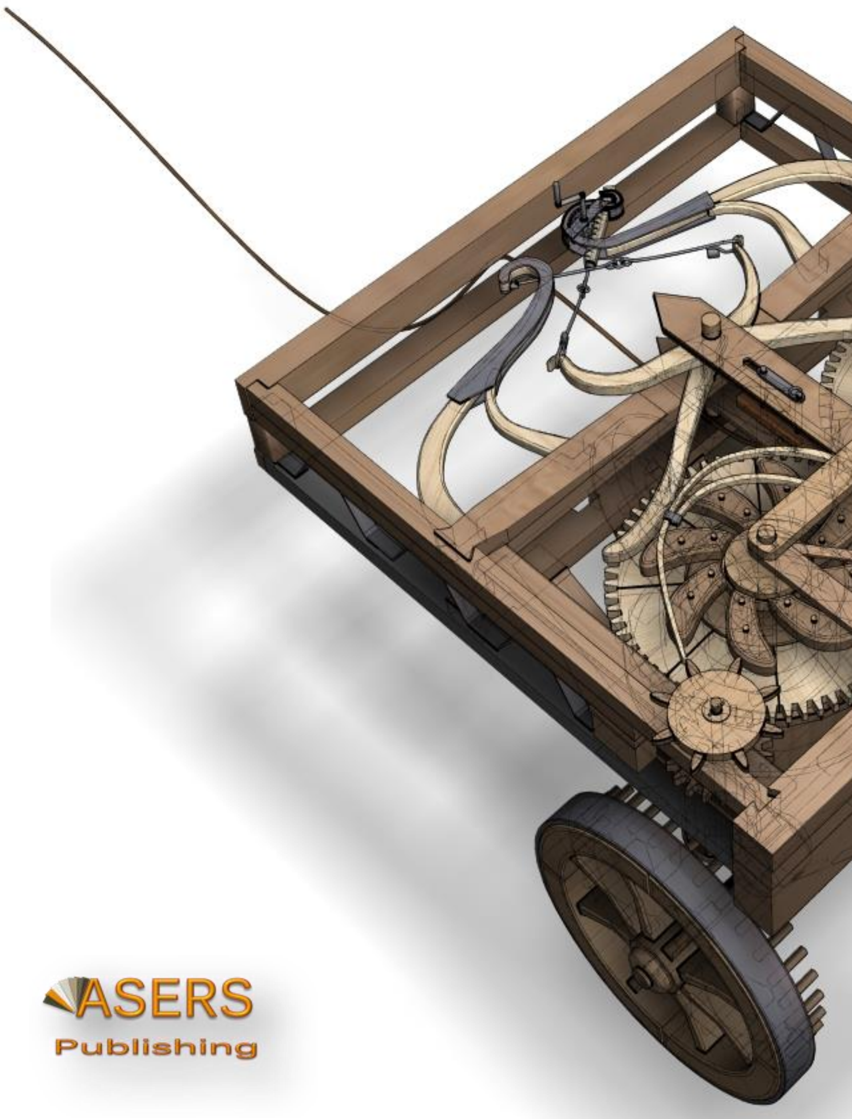
Theoretical and Practical Research in Economic Fields



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CREDIT LIBERALIZATION REFORM: A SIMPLE MODEL

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Abstract:

This note presents a simple setup of credit liberalization. We find that the effect is not uniform but depends on the level of GDP. In other words, the model predicts that richer countries benefit more than poor countries from opening up their capital account. This finding has important policy implications, as it suggests that developing economies should be cautious when it comes to the liberalization of their capital account.

Keywords: credit liberalization; capital account reform.

JEL Classification: E24; E32.

Introduction

The model follows closely the setup proposed by Adam (2009) in the discussion of Abiad, Leigh and Mody (2009). The setup is a 2-period model, where the insights can be easily extended to a multi-period setup.

$$\max_{(c_1,c_2,d,k)} \ln c_1 + \beta \ln c_2 \tag{1}$$

s.t.

$$c_1 \leq y_1 + d - k \tag{2}$$

$$c_2 \leq Ak - dR \tag{3}$$

$$d \leq \theta \frac{y_2}{R} = \theta \frac{Ak}{R} \tag{4}$$

where $0 < \beta < 1$ is the discount factor, and c_1, c_2 are consumption levels in period 1 and 2, respectively. The gross interest rate is $1 + r = R > 1$ (Where r denotes the net interest rate) is exogenously given, as well as y_1, which is the level of output in period 1. $y_2 = Ak$ is the output in period 2, which is endogenousy determined by an Ak-type production function, where A is the level of total factor productivity in period 2, and k denotes (both investment and) the stock of physical capital. Thus, A is also the marginal return to capital, with A>R. d denotes borrowing ("debt"). Finally, $\theta \in (0, R/A)$ is the parameter that will capture the degree of credit imperfection ("borrowing constraints"), with $\theta = 0$ representing toal exclusion from capital markets. Similarly, an increase in θ, as in Adam (2009), will be interpreted as an increase in the country's degree of financial integration.

It is easy to show that in this 2-period model, the borrowing constraint will be binding. The other constraints from the budget set will also hold with equality. The model can be reformulated, and the expressions for $\{c_1, c_2, d\}$ could be substituted back into the utility function to produce

$$\max_k ln(y_1 + \theta \frac{Ak}{R} - k) + \beta \ln(Ak - \theta Ak) \quad (5)$$

FOC:

$$k: \frac{\theta\frac{A}{R}-1}{y_1+\theta\frac{Ak}{R}-k} + \beta \frac{A-\theta A}{Ak-\theta Ak} = 0 \quad (6)$$

or

$$\frac{\theta\frac{A}{R}-1}{y_1+\theta\frac{A}{R}-k} + \frac{\beta}{k} = 0, \quad (7)$$

Rearranging

$$(1 - \theta \frac{A}{R}) \ k - \beta(\theta \frac{Ak}{R} - k) \ = \beta y_1, \quad (8)$$

$$(1 - \theta \frac{A}{R}) \ k + \beta k(1 - \theta \frac{A}{R}) \ = \beta y_1, \quad (9)$$

$$(1 + \beta)(1 - \theta \frac{A}{R}) \ k = \beta y_1, \quad (10)$$

$$k = \frac{\beta y_1}{(1+\beta)(\frac{\theta A}{R}-1)}, \quad (11)$$

Thus

$$\frac{d}{y_1} = \frac{\theta Ak}{R y_1} = \frac{\theta A}{R} \frac{\beta}{(1+\beta)(1-\theta\frac{A}{R})} = \frac{\beta}{(1+\beta)(\frac{\theta A}{R}-1)}, \quad (12)$$

The implied gross growth rate of output (per capita) is:

$$1 + g = \frac{y_2}{y_1} = \frac{Ak}{y_1} = \frac{A}{y_1} \frac{\beta y_1}{(1+\beta)(\frac{\theta A}{R}-1)} = \frac{\beta A}{(1+\beta)(\frac{\theta A}{R}-1)}, \quad (13)$$

Relaxing the credit constraint then leads to higher growth:

$$\frac{\partial g}{\partial \theta} = \frac{\beta A}{1+\beta} \left[\frac{1}{(1-\theta\frac{A}{R})^2}\right] \frac{A}{R}, \quad (14)$$

This is because an increase in θ increases borrowing (d), or

$$\frac{\partial d}{\partial \theta} = \frac{\beta y_1}{1+\beta} \left[\frac{1}{(\frac{R}{\theta A}-1)^2}\right] \frac{R}{\theta^2 A} > 0, \quad (15)$$

which in turn increases investment in capital k, as

$$\frac{\partial k}{\partial \theta} = \frac{\beta y_1}{1+\beta} \left[\frac{1}{(1-\theta\frac{A}{R})^2}\right] \frac{A}{R} > 0, \quad (16)$$

and thus increases period-2 output:

$$\frac{\partial y_2}{\partial \theta} = \frac{\partial (Ak)}{\partial \theta} = A \frac{\partial k}{\partial \theta} = \frac{\beta A y_1}{1+\beta} \left[\frac{1}{(1-\theta\frac{A}{R})^2}\right] \frac{A}{R} > 0, \quad (17)$$

Given the exogenously given y_1, then it leads to higher growth. This is also the transmission channel that the empirical strategy tries to capture in Abiad *et al.* (2009).

As suggested by Adam (2009), the problem above produces non-linear effects of credit liberalization. The marginal effects from relaxing the credit constraint are small for small values of θ, but when $\theta \to (\frac{R}{A})_{-}$, borrowing and output growth become more sensitive to further liberalization, or $\frac{\partial k}{\partial \theta}, \frac{\partial d}{\partial \theta}, \frac{\partial y_2}{\partial \theta}, \frac{\partial g}{\partial \theta} \to \infty$. However, the model in its current smple form predicts that the size of the country does not matter for the effect of credit market liberalization (which is inconsistent with the empirical findings).

In particular, the setup predicts that a country's debt-to-output ratio is independent of the country's income level, or:

$$\frac{\partial(d/y_1)}{\partial y_1} = 0. \tag{18}$$

As a consequence, there is no interaction between an individual country's degree of credit liberalization and income, or

$$\frac{\partial^2(d/y_1)}{\partial y_1 \partial \theta} = 0. \tag{19}$$

Yet, the empirical findings show this not to be true.

In order to make the model consistent with empirical findings, we need to assume that the profitability of investment projects (*i.e.*, the return to capital) varies with the country's levels. In particular, the marginal return on a project is higher in a low-income country (due to the relative scarcity of capital), or: A=A(y) with

$$A'(y) = \frac{\partial A}{\partial y} < 0. \tag{20}$$

This assumption is implicitly derived from a production function, which is concave in the capital stock (which is also per person, as there is an infinitely lived representative agent in the economy).

Some of the countries might be poor because of the existence of borrowing constraints, which prevents them from growing optimally due to the inability to invest and accumulate the efficient level of physical capital. With this extension

$$k = \frac{\beta y_1}{(1+\beta)(1-\theta\frac{A(y)}{R})} \tag{21}$$

and

$$\frac{d}{y_1} = \frac{\beta}{(1+\beta)(\frac{R}{\theta A(y)}-1)} = \frac{\beta\theta A(y)}{(1+\beta)(R-\theta A(y))}, \tag{22}$$

which implies that

$$\frac{\partial(\frac{d}{y_1})}{\partial \theta} = \frac{\beta}{1+\beta}\frac{\theta A'(y)}{(1+\beta)(R-\theta A(y))^2} < 0, \tag{23}$$

which implies that relatively poorer countries will borrow more (temporarily). Also

$$\frac{\partial g}{\partial \theta} = \frac{\partial}{\partial \theta}\left[\frac{\beta R A(y)}{(1+\beta)(R-\theta A(y))}\right] = \frac{\beta R[A(y)]^2}{(1+\beta)(R-\theta A(y))^2} > 0, \tag{24}$$

so liberalizing credit markets leads to higher per-capita growth, and in addition,

$$\frac{\partial^2 g}{\partial \theta \partial y} = \frac{\beta R}{(1+\beta)\left(R-\theta A(y)\right)^2} 2A'(y)A(y)[R-\theta A(y)][R+(R-1)\theta A(y)] > 0, \tag{25}$$

or richer countries benefit more from credit liberalization (and grow faster)

Conclusions

This note presents a simple setup of credit liberalization. We find that the effect is not uniform, but depends on the level of GDP. In other words, the model predicts that richer countries benefit more than poor countries from opening up their capital account. This finding has important policy implications, as it suggests that developing economies should be cautious when it comes to the liberalization of their capital account.

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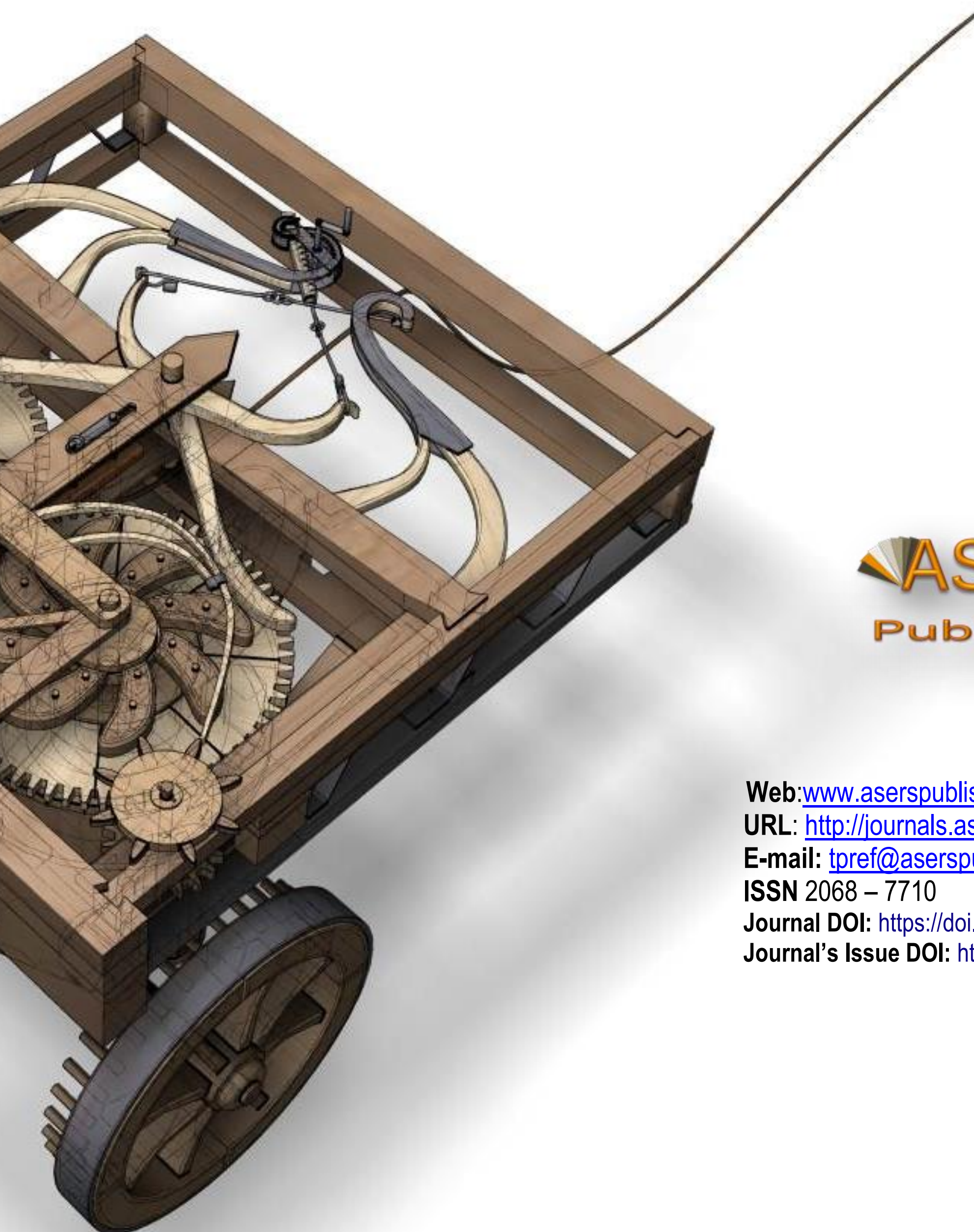

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