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# Financial Integration, Financial Frictions and Business Cycles of Emerging Market Economies

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**Abstract**

**International financial integration has the potential benefit of mitigating the eects of shocks through risk sharing. However, in many instances, emerging**

# 1 Introduction

During the past few decades, both developed and emerging markets economies have taken steps to liberalize their capital accounts and become integrated with the international financial market. According to the existing literature, financial integration has the potential benefit of mitigating the effects of shocks through international risk sharing. Because emerging market economies are characterized by more volatile business cycles compared to industrial economies, they are supposed to benefit more from financial integration. However, the data indicates that, in many instances, business cycles in emerging markets become even more volatile after international financial integration.

To obtain a comprehensive picture of business cycle behaviors following international financial integration, I first perform detailed data analysis for both industrial and emerging market economies. I find that as financial openness level increases, the majority of industrial economies experience less volatile business cycles. In contrast, more than half of the emerging market economies experience more volatile business cycles. The heterogeneity in the responses of business cycles to financial integration is not captured by standard macro models, which predict uniform response of decreasing business cycle volatilities. The findings suggest the need for a model to explain the distinctive behaviors of emerging market economies' business cycles.

I build a business cycle model in which the degree of shock amplification and propagation is endogenously determined by the level of international financial integration. This is achieved by embedding a financial accelerator following Bernanke, Gertler, and Gilchrist (1999) (henceforth BGG) into a small open economy real business cycle (RBC) model where terms of trade shock and productivity shock are the driving forces. In this model, the level of financial integration is modeled as a reduced-form international interest rate premium. Changes in the level of financial integration are transmitted into the economy through firms' financial position. The model can very well account

countries that are more financially integrated can better smooth aggregate shocks. Whether the smoothing channel or the leverage channel dominates depends on the degree of financial frictions in the domestic financial market. In developed economies with well-developed financial market, the smoothing channel dominates. In emerging economies with high degree of financial friction, the leverage channel dominates.

The results of this paper are robust to di erent model specifications. I consider two di erent ways to model household borrowings and lendings; one features zero aggregate households' borrowings and the other takes into account households' consumption smoothing via borrowing and lending. The analysis shows that the model mechanisms are not sensitive to the inclusion of improved households' consumption smoothing through financial integration.

The predictions of the model are in line with Prasad and Rajan (2008), who point out that there are thresholds for benefiting from financial openness. The quali

**Financial openness in both industrial and emerging market economies increased in the past few decades. Figure 1 plots the financial openness levels before**

the majority of emerging market economies did not benefit from financial integration in terms of business cycle smoothing. This result is also supported by Figure 6, which shows the relationship between financial openness and consumption volatility for emerging market economies. If the conventional wisdom of financial integration applies, we should see a significantly negative correlation. However, Figure 6 shows that the least-square fitted line is rather flat and even slightly positively sloped.

Standard macro models fail to explain business cycle behaviors in emerging market economies. As already pointed out, one important reason is that in such models, financial structure does not affect the real economy. As opposed to industrial economies, emerging market economies are characterized by poorly developed domestic financial markets. Table 2 lists the number of bank branches per 100,000 adults. On average, emerging markets have 15 branches while industrial economies have more than 30. Furthermore, more firms in emerging market economies identify themselves as financially constrained. Table 3 shows that in Euro Area, about 14 percent of firms report financial constraints, while among European and Central Asian developing countries this figure rises to 24 percent. Both tables show that emerging markets on average have less developed financial sectors than industrial economies, indicating an important role of domestic financial frictions.

## 3 Model

I consider a small open economy real business cycle model. The model features five agents: households, importers, domestic good producers, distributors, and banks. Each agent has a unit mass. Households work, consume, and supply physical capital to good producers. They also buy or sell one-period bond. In aggregate, household savings and borrowings are zero. Importers import raw goods from the rest of the world, and borrow from banks. Banks act as intermediaries, transferring funds from international depositors to domestic importers. Consumption goods are produced by domestic good producers and distributors.

## 3.1 Production

There are two production sectors in this economy: the domestic goods sector and foreign goods sector. The numeraire is the foreign goods. Firms in the domestic goods sector face perfect competition. They employ labor and capital to produce output according to

$$Y_t^d = {}_t^d K_t^{\alpha_d} H_t^{1-\alpha_d} \qquad {}_d \in (0\ 1) \tag{1}$$

where $K_t$ and $H_t$ are capital and labor respectively. The parameter $_d$ denotes the capital share. The term $_t^d$ denotes total factor productivity (TFP), which follows the AR(1) process[1]

$$\ln {}_t^d = {}_d \ln {}_{t-1}^d + {}_t \qquad {}_d \in (0\ 1) \tag{2}$$

Each firm pays capital and labor in accordance with the marginal productivity

$$r_t = {}_d Y_t^d \ K_t \tag{3}$$

$$w_t = (1 - {}_d) Y_t^d \ H_t \tag{4}$$

where $r_t$ and $w_t$ denote the equilibrium factor prices.

Foreign goods are produced by distributors. Distributors buy imported raw goods from importers, repackage and sell them to consumers. Distributors treat imported raw goods as intermediate inputs and produce final outputs (foreign goods) using the technology

$$Y_t^m \ {}_t^m \ t = 1$$

TFP of distributors, which follows the AR(1) process

$$\ln {}^{m}_{t} = {}_{m} \ln {}^{m}_{t-1} + {}_{t} \quad {}_{m} \in (0\ 1) \tag{6}$$

where ${}_{m}$ is the persistence parameter. The innovations to TFP, ${}_{t}$, are drawn from a normal distribution with mean 0 and variance ${}^{2}_{\upsilon}$.

Distributors distribute the remaining output to households after paying the importers, as households are the owners of the business. Dividends to households can be written as

$$\Xi_t = Y^{m}_{t} - {}^{m}_{t} q_t \quad {}_{t-1} \tag{7}$$

## 3.2 Financial Market and Frictions

Financial frictions are introduced in the interactions between importers and banks. Importantly, importers need to borrow from banks to finance their purchases of imported raw goods. As is standard, the asymmetric information between borrowers and lenders, together with, the monitoring cost paid in the case of default, give rise to the financial frictions.

### I port rs Borrow rs

The assets of an importer are the sum of her net worth ${}^{i}_{t}$ and borrowed funds $B^{i}_{t}$,

$$q_t \quad {}^{i}_{t} = {}^{i}_{t} + B^{i}_{t} \tag{8}$$

where $q_t \quad {}^{i}_{t}$ denotes the total value of imported raw goods and $q_t$ is the terms of trade in unit of the numeriare good. The terms of trade evolves according to the AR(1) process

$$\ln q_t = {}_{q} \ln q_{t-1} + {}_{t} \quad {}_{q} \in (0\ 1) \tag{9}$$

where ${}_{q}$ is the persistence parameter. The innovations to terms of trade, ${}_{t}$, are drawn from a normal distribution with mean 0 and variance ${}^{2}_{\varsigma}$.

**Additionally, every importer is subject to an idiosyncrati**

and

$$ {}^{m}_{t+1} = {}^{m} \frac{Y^{m}_{t+1}}{{}_{t}} \tag{13} $$

The left-hand side of the break even condition Eq. (10) expresses the returns on risky loans to the bank net of monitoring cost . It includes the repayment from the solvent importers, i.e., the first component of $\Gamma(\bar{}_{t+1})$, and the repayment by defaulting importers, i.e., the second component of $\Gamma(\bar{}_{t+1})$ net of $G(\bar{}_{t+1})$. The term $^{m}$

importer's problem yields the contract $(L_t, \bar{\omega}_{t+1})$ that maximizes the expected profit.

Following Bernanke, Gertler, and Gilchrist (1999), I assume that, at the end of each period, a fraction $1 - \gamma$ of importers will die and be replaced by a new cohort so as to keep the number of importers constant.[4] In order to endow those new born importers initial wealth, households transfer $^e$ as a lump sum to each importer. Therefore, the aggregate net worth evolves according to

$$t+1$$

of the represented household is given by

$$C^m_t + p_t(C^d_t + X_t) + \quad _{t-1}B^d_{t-1} = p_t(w_t L_t + r_t K_t) + B^d_t + \Xi_t + \Omega_t \tag{20}$$

where $p_t$ denotes the relative price of domestic goods. Alongside income from supplying labor and capital, households also receive dividends $\Xi_t$ and transfer payment $\Omega_t$. Therefore, the household's income and consumption are sensitive to unexpected shifts in the distributor's profit or importer's net worth.

Households own physical capital and make investment $X_t$. Capital accumulates as

$$K_{t+1} = \Phi\left(\frac{X_t}{K_t}\right) K_t + (1 - \quad)K_t \tag{21}$$

where

$$\Phi\left(\frac{X_t}{K_t}\right) = \frac{w_1}{1 - \frac{1}{\xi}}\left(\frac{X_t}{K_t}\right)^{1-\frac{1}{\xi}} + w_2 \tag{22}$$

The term $\Phi\left(\frac{X_t}{K_t}\right)$ represents the investment adjustment cost. The parameter measures the elasticity of investment to Tobin's q. As $\to +\infty$, the above accumulation process collapses down to $K_{t+1} = X_t + (1 - \quad)K_t$. Parameters $w_1$ and $w_2$ are set so that in the steady state $\Phi(\ ) =$ and $\Phi(\ )' = 1$.

## 3.4 International Financial Market

In this economy, the aggregate household lending is zero. Thus, the debt position of the economy in the international financial market is determined by the importers' borrowing $B_t$. The interest rate $^*_t$ is augmented by a small risk premium term such that

$$^*_t = \bar{\ } + \left(\exp(B_t) - 1\right) \tag{23}$$

where $\bar{\ }$ is the international risk-free interest rate and 0 denotes the sensitivity of the interest rate to the debt level. The higher is, the higher obstacle the economy needs to overcome to obtain credit. Therefore, an increase in the financial integration level is modeled as a reduction in . For simplicity, the following discussion uses to denote the international borrowing premium.

It is important to realize that the degree of financial frictions in this economy is closely related to the value of . To see this, note that the bank's break even condition can be written as the supply

In the resource constraint Eq. (26), $EX_t$ denotes total amount of exports. It equals the sum of imports $q_t \;{}_t$ and next exports ${}^{*}_{t-1}B_{t-1} - B_t$, as shown in Eq. (27). The term ${}_t$ denotes the monitoring cost. Therefore, the produced goods $Y_t^m$ is consumed, used to cover the monitoring costs, and exported.

In particular, from the household's budget constraint, I derive

$$C_t^m = \Xi_t + \Omega_t \tag{29}$$

That is households' consumption of foreign goods is the sum of dividends $\Xi_t$ and transfer payments $\Omega_t$

I choose the following nine second moments:

$$(\Theta) = \left[\ {}^2(Y)\quad \frac{{}^2(C)}{{}^2(Y)}\quad \frac{{}^2(X)}{{}^2(Y)}\quad \frac{{}^2(\ B)}{{}^2(Y)}\quad \frac{{}^2(\ ^*)}{{}^2(Y)}\quad (C\ Y)\quad (X\ Y)\quad (\ B\ Y)\quad (\ ^*\ Y)\ \right]' \tag{30}$$

where $\Theta = [\ \ m\ \ q\ \ \upsilon\ \ \varsigma\ ]'$ is the vector of parameters. The trade balance $B$ is defined as the ratio of net export to output, i.e.

The reason is the low estimated value of the borrowing premium . a□ects the sensitivity of *
to changes in the debt position. For the estimated value of = 0 08, debt changes barely a□ect

The persistence $_{q}$ and standard deviation $_{\varsigma}$ of terms of trade shock is estimated to be 0.89 and 0.102, respectively. The value of $_{\varsigma}$ implies that terms of trade shock plays a non-negligible role in generating the model moments. Table 8 reports the variance decomposition of the two shocks. The innovations to TFP and terms of trade contribute roughly equally to the fluctuations in output. However, innovations to terms of trade contributes substantially more to the volatility of consumption, which explains the high volatility of consumption in emerging economies. Moreover, the fluctuations in the interest rate, trade balance and investment all rely heavily on terms of trade shock.

## 6 Financial Integration and Model Mechanism

In this section, I examine the estimated model with different levels of financial integration. The key question to answer is what happens to the volatilities of output and consumption once the level of financial integration changes.

The level of international financial integration is represented by the international borrowing premium . Because one important aspect of financial integration is removing obstacles for countries to participate in the international financial market, it is reasonable to assume that a decrease in represents a more integrated financial market. Miyamoto and Nguyen (2015) model the frictions in a similar way and finds that differs significantly for developed and developing countries.

Figure 7 and 8 plot the standard deviations of output and consumption for different values of , with the other parameters calibrated and estimated as in Section 5. Both figures are V-shaped with a minimum when is around 0.15. To facilitate the discussion, I divide both figures into two regions, Region I and II.

In Region I, the model produces a considerable drop in both the standard deviations of output and consumption when goes up. Specifically, asecgoah a74.8dΩ[(g)5(o)-28.0Q07((u)-5.99775a)5(04.014(4(n)-6])bg)-3

Note that the estimated value of in the post-integration period is 0.08, thus is in Region I. In this region, the volatilities of output and consumption increases as goes down, which is consistent with the empirical fact that emerging market economies experience more volatile business cycles after financial integration.

The agreement of the model prediction with the experience of emerging economies follows from the counter co-movement of both leverage and external financing premium with . Figures 9 and 10 plot the steady state values of leverage and external financing premium as a function of . The figures show that a reduction in raises both the leverage and external financing premium. Evidently, borrowers increase their leverages once borrowing cost goes down. Yet, an increasing leverage comes at the cost of a higher financing premium. The is because higher e□ciency loss must be incurred as increasing value of credits are intermediated through a frictional financial market.

It is the increasing leverage coupled with financial frictions that explain higher volatilities when goes down, as observed in Region I. Consider the net worth accumulation process

$$_t = \gamma \quad {}^{m}_{t} q_{t-1} \quad {}_{t-1} - \quad {}^{*}_{t-1}(q_{t-1} \quad {}_{t-1} - \quad {}_{t-1}) - \quad {}_{0}^{\bar{\omega}_t}$$

In Region II, the model predicts decreasing standard deviations of output and consumption when goes down. At first glance, this might be somewhat surprising, because this is the characteristic of industrial economies. Note that in Region II, the value of is large. In this case, borrowers' leverage and the measured financial friction stay at very low level.[11] Therefore, the leverage channel plays a negligible role in this region. Intuitively, this is because when the borrowing premium is too large, firms are discouraged from borrowing or taking leverage. As a result, the domestic financial market is not functioning.

In this region, conventional smoothing effect of financial integration plays the predominant role. Consider the terms of trade shock. According to and smoothing channel.

the financial market. The external financing premium that measures the degree of financial frictions can be written as

$$ {}^{m}_{t} - {}^{*}_{t} = \frac{\int_0^{\bar{\omega}_{t+1}} \omega \;\; {}_{t+1} \; F( \; {}_{t+1}) \; {}^{m}_{t+1} q_t \;\; {}_{t}}{q_t \;\; {}_{t} - \;\; {}_{t}} \tag{34} $$

which depends on the value of . A decrease in the monitoring cost reduces this premium and hence the frictions in the financial market.

The standard deviation $_{\omega}$ of the lognormal distribution of the idiosyncratic disturbance also affects financial development. The value of $_{\omega}$ measures the difficulty for lenders to monitor the state of borrowers. When $_{\omega}$ approaches zero, the asymmetric information between borrowers and lenders disappears. Therefore, lower value of $_{\omega}$ implies a more efficient domestic financial market.

Figures 13 and 14 plot the steady state leverage and external financing premium as a function of and $_{\omega}$. In Figure 13, as and $_{\omega}$ get lower, optimal leverage rises. Meanwhile, as shown in Figure 14, external financial premium decreases. The figures show that financial development reduces financial frictions and encourages firms to raise leverage. Recall that in Figure 9 and 10, financial integration increases firms' leverage, but with the cost of raising financial frictions.

Therefore, it is expected that changes in the level of financial development affect business cycles differently from changes in the level of financial integration. Figures 15 and 16 plot the standard deviations of output and consumption as a function of and $_{\omega}$. In both figures, as and $_{\omega}$ get lower, volatilities go down. This is because an improvement of financial development reduces the degree of financial frictions in the domestic economy. The latter leads to less volatile business cycles.

## 8 Robustness Analysis

The model in previous sections assumes that the household aggregate borrowing and saving are zero so that the only channel that financial integration affects the economy is through the importer-bank connection. In light of this, it is important to explore to which extent this assumption affects the model mechanism.

To this end, I build an extended model, in which the population is splitted into two types: patient households and impatient importers. Patient households supply labor and capital to the good producers, and become net savers in this economy. Impatient importers borrow and import raw goods from the rest of the world. The population share of patient households is $\pi_s$, and that of the impatient importers is $1 - \pi_s$. Banks collect deposits from both international and domestic savers and make loans to impatient importers. As before, distributors and domestic good producers produce final goods that are readily consumable.

## 8.1 Model Features

The patient household, denoted by a subscript $s$, solves the the following problem:

$$\max \quad E_0 \sum_{t=0}^{\infty} {}^{t}_{s} \, (C^d_{st} \; C^m_{st} \; H_{st}) \tag{35}$$

subject to

$$C^m_{st} + p_t(C^d_{st} + X_{st}) + {}_t = p_t(w_t H_{st} + r_t K_{st}) + {}^h_{t-1} \; {}_{t-1} + \Theta^{tran}_{st} \tag{36}$$

$$K_{st+1} = \Phi \left( \frac{X_{st}}{K_{st}} \right) K_{st} + (1 - \;)K_{st} \tag{37}$$

where Eqs. (36) and (37) denote the budget constraint and capital accumulation process, respectively. The term ${}_t$ denotes household savings at period where $G(\bar{\omega}_{t+1}) \equiv \int_0^{\bar{\omega}_{t+1}} \omega_{t+1} dF(\omega_{t+1})$ and $\Gamma(\bar{\omega}_{t+1}) \equiv [1 - F(\bar{\omega}_{t+1})]\bar{\omega}_{t+1} + G(\bar{\omega}_{t+1})$.

Formally, the impatient importer discounts the future more than the patient household. For this, the discount factors satisfy $\beta_i < \beta_s$. This implies that importers consume earlier than households, preventing importers from becoming self-financed. In the budget constraint, the term $\Gamma(\bar{\omega}_t) R^m_t q_{t-1} m_{it-1}$ represents expected repayment to the bank which depends on the realized value of $\omega$. The term $D_t$ denotes the amount of loans that the importer takes from the bank. In the bank's break-even condition, the right hand side represents the cost of raising funds from domestic and international savers. Here, it is assumed that the bank first collects deposits from domestic savers and then fills the credit gap from international funds. The interest rate charged by the international financial market is $R^*_t$.

I model the two interest rates following Schmitt-Grohé and Uribe (2003):

$$R^*_t = \bar{R} + \psi \left[ \exp(B_t) - 1 \right] \tag{41}$$

and

$$R^h_t = \bar{R} + \tilde{\psi} \left[ \exp(\cdot_t) - 1 \right] \tag{42}$$

where $\psi > 0$ represents the international borrowing premium, and the constant parameter $\tilde{\psi} > 0$ induces stationarity. Specifying different interest rates is justified in the sense that the economy is only partially opened depending on the value of $\psi$. An international financial integration process

## 8.2 Model Performances

The model is estimated with the inclusion of ˜. The two additional parameters $r_s$ and $_i$ are calibrated as 0.5 and 0.97 respectively.[13] All other parameters are calibrated in line with the original model.

Table 11 reports the estimated parameter values. The estimated is 0.099, which is near the value obtained in the original model. The estimated ˜ is large at -10.854. However, its standard error implies that ˜ does not have significant impact on the model moments.

financial frictions also increase. The latter leads to more volatile business cycles. The smoothing channel reflects the conventional wisdom of financial integration; countries that are more financially integrated can better smooth fluctuations. Whether the leverage channel or the smoothing channel dominates depends on the degree of financial frictions in the domestic financial market. Consistent with empirical data, the model predicts that financial integration stabilizes business cycles when the country has a well developed financial market, but increases the economic volatility when the domestic financial market is imperfect.

In the future, it would be interesting to explore some extensions to the present model. In its current form, the international financial market is modeled as a reduced form. It may be worthwhile to model the international financial market in more details.

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Bo N O N N

Table Business Cycles of Selected Countries

| | $(C)$ $(Y)$ | | $(C)$ $(Y)$ |
|---|---|---|---|
| **EME** | | **Industrial E** | |
| Brazil | 1.32 | Australia | 0.96 |
| Chile | 1.87 | Canada | 0.73 |
| Colombia | 1.27 | Finland | 0.81 |
| India | 0.84 | France | 0.73 |
| Indonesia | 2.17 | Germany | 0.66 |
| Korea | 1.14 | Italy | 0.86 |
| Malaysia | 1.42 | Japan | 0.76 |
| Mexico | 1.27 | Netherlands | 0.93 |
| Morocco | 1.11 | Portugal | 0.95 |
| Peru | 1.07 | Spain | 1.08 |
| Philippines | 0.46 | Sweden | 0.87 |
| South Africa | 1.20 | UK | 1.00 |
| Thailand | 0.99 | USA | 0.83 |
| *Average* | 1.24 | *Average* | 0.86 |

Note: Annual data from World Bank database. $(C)$ denotes the standard deviation of private consumption and $(Y)$ denotes the standard deviation of GDP. EME stands for emerging market economy. Industrial E. stands for industrial economy. All series have been logged and detrended using HP filter.

Table [illegible] Number of Bank Branches per [illegible] Adults

| E[illegible]E | | Industrial E | |
|---|---|---|---|
| Argentina | 13.31 | Australia | 30.89 |
| Brazil | 43.62 | Austria | 12.98 |
| Chile | 15.17 | Brazil | 50.26 |
| Colombia | 13.86 | Canada | 24.35 |
| Egypt | 4.22 | Denmark | 48.35 |
| Hong Kong | 23.43 | Finland | 15.28 |
| India | 9.45 | France | 38.02 |
| Indonesia | 6.52 | Germany | 17.46 |
| Israel | 19.70 | Greece | 38.41 |
| Korea | 18.17 | Ireland | 32.91 |
| Malaysia | 11.07 | Italy | 66.31 |
| Mexico | 12.81 | Japan | 34.12 |
| Morocco | 15.18 | Netherlands | 26.95 |
| Pakistan | 8.02 | New Zealand | 34.93 |
| Peru | 25.94 | Norway | 11.73 |
| Philippines | 7.90 | Portugal | 65.62 |
| Singapore | 10.8 | Spain | 99.80 |
| South Africa | 7.94 | Sweden | 23.42 |
| Thailand | 9.71 | Switzerland | 54.34 |
| Turkey | 15.78 | UK | 26.72 |
| Venezuela | 16.97 | USA | 34.45 |
| *Average* | 14.75 | *Average* | 37.49 |

Note: Data from Global Financial Development database. The number of bank branches per 100,000 adults measures the access to financial institutions. EME stands for emerging market economy. Industrial E. stands for industrial economy.

**Table [illegible]: Percentage of Firms Identifying Access to Finance as a Constraint**

| Region | Percentage |
|---|---|
| Euro Area | 14.28 |
| Europe & Central Asia (developing only) | 24.37 |
| Latin America | 37.56 |

Table : Calibration of Basic Parameters

| Parameters | Description | Value | Target |
|---|---|---|---|
| | Discount factor | 0.98 | Average annual interest of 8% |
| | inverse of Frisch elasticity of labor supply | 0.65 | Labor supply elasticity of 1.7% |
| | Value of risk averse | 2 | Common in SOE literature |
| | Relative importance of leisure | 1.6 | Agent spends 1/3 time on working |
| | Elasticity of substitution 1 (1 − ) | 0.5 | Common in macro literature |
| d | Capital income share | 0.33 | Standard capital share of 0.3 |
| m | Distributor production function | 0.33 | Benchmark production tech. |
| | Capital depreciation rate | 0.02 | Ave. investment ratio is 17% |
| | Monitoring cost | 0.32 | Fernández and Gulan (2015 |

Tabl o o nts

| Moment | EME | | Model | |
|---|---|---|---|---|
| **Panel A. targeted moments** | | | | |
| $(Y)$ | 3.13 | (0.003) | 3.78 | (0.220) |
| $(C)$ $(Y)$ | 1.31 | (0.004) | 1.40 | (0.032) |
| $(X)$ $(Y)$ | 3.95 | (0.014) | 3.07 | (0.306) |
| $(C\ Y)$ | 0.78 | (0.054) | 0.95 | (0.010) |
| $(X\ Y)$ | 0.64 | (0.063) | 0.82 | (0.050) |
| $(\ B\ Y)$ | -0.34 | (0.086) | -0.34 | (0.029) |
| $(\ ^*\ Y)$ | -0.39 | (0.052) | -0.34 | (0.048) |
| $(\ B)$ | 2.86 | (0.003) | 1.48 | (0.327) |
| $(\ ^*)$ | 0.87 | (0.000) | 0.19 | (0.032) |
| **Panel B. other moments** | | | | |
| $(\ ^*\ C)$ | -0.39 | (0.088) | -0.51 | (0.108) |
| $(\ ^*\ X)$ | -0.35 | (0.057) | -0.50 | (0.060) |
| $(\ ^*\ \ B)$ | 0.29 | (0.096) | -0.37 | (0.082) |
| $(\ B\ C)$ | -0.68 | (0.057) | -0.40 | (0.072) |
| $(\ B\ X)$ | -0.71 | (0.053) | -0.55 | (0.101) |

Note: ( ) is the standard deviation of the variable in the bracket and ( ) is the correlation of variables in the bracket. Standard errors of estimation are reported in the brackets. See Appendix A for data sources.

Tabl Est at ara t rs

| Parameter | | | m | q | υ | ς |
|---|---|---|---|---|---|---|
| Estimated value | 0.080 | 2.873 | 0.994 | 0.890 | 0.020 | 0.102 |
| | (0.012) | (1.264) | (0.010) | (0.218) | (0.002) | (0.015) |

Note: Standard errors of estimation are reported in the brackets.

Tabl ar anc D co pos t on

| oc | $Y$ | $C$ | $X$ | $B$ | |
|---|---|---|---|---|---|
| m | 55.11 | 25.05 | 6.50 | 0.90 | 1.02 |
| $q$ | | | | | |

**Tabl Ext n o o o nts**

| Targ t o nts | | | on targ t o nts | | |
|---|---|---|---|---|---|
| $(Y)$ | 3.78 | (0.265) | $( \; ^* \; C)$ | -0.67 | (0.094) |
| $(C) \quad (Y)$ | 1.68 | (0.067) | $( \; ^* \; X)$ | -0.35 | (0.244) |
| $(X) \quad (Y)$ | 3.58 | (0.384) | $( \; ^* \quad B)$ | -0.30 | (0.038) |
| $(C \; Y)$ | 0.90 | (0.025) | $( \; B \; C)$ | -0.28 | (0.112) |
| $(X \; Y)$ | 0.78 | (0.063) | $( \; B \; X)$ | -0.72 | (0.137) |
| $( \; B \; Y)$ | -0.30 | (0.059) | | | |
| $( \; ^* \; Y)$ | -0.35 | (0.077) | | | |
| $( \; B)$ | 1.79 | (0.227) | | | |
| $( \; ^*)$ | 0.27 | (0.044) | | | |

Note: ( ) is the standard deviation of the variable in the bracket and ( ) is the correlation of variables

**Figure Change in Financial Openness**

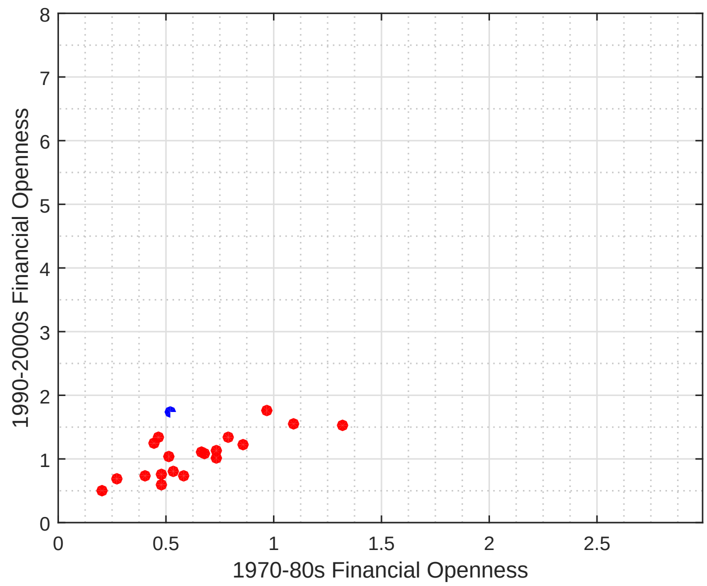


**Figure : Change in Consumption Volatility, Industrial Economies**

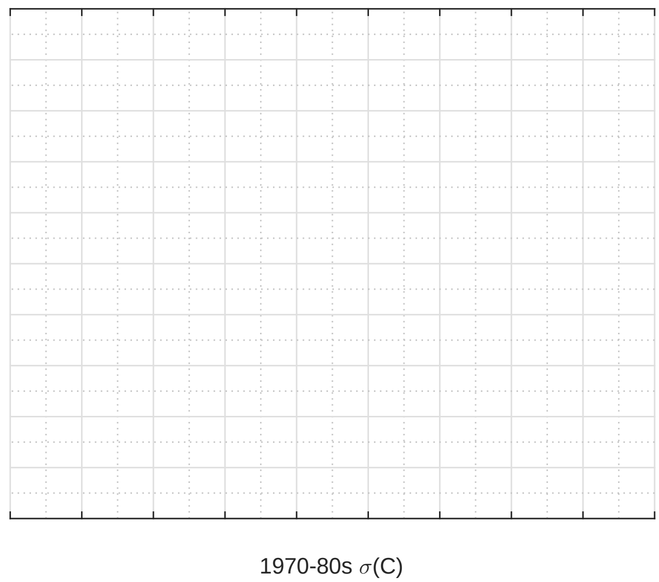


**Figure [illegible] Cyclical Patterns**

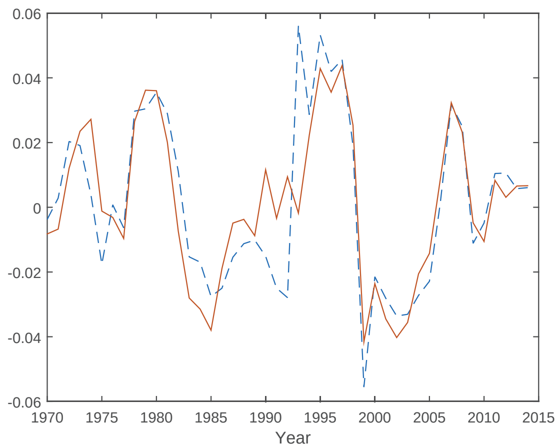
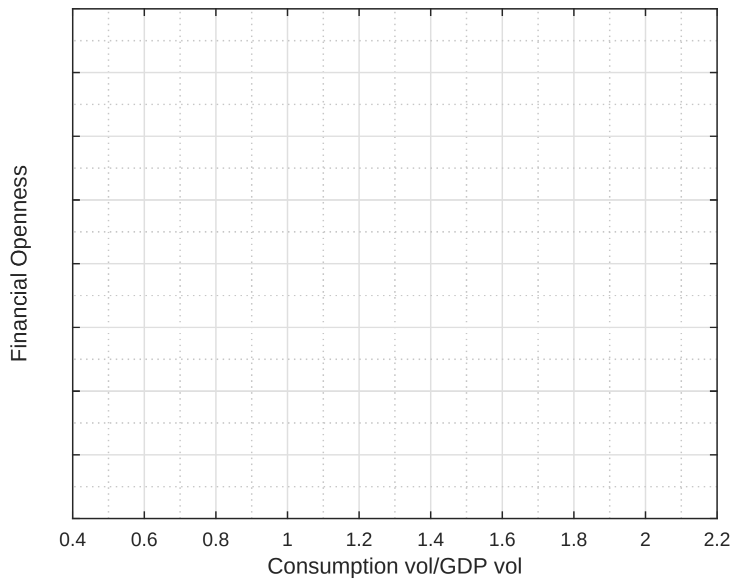
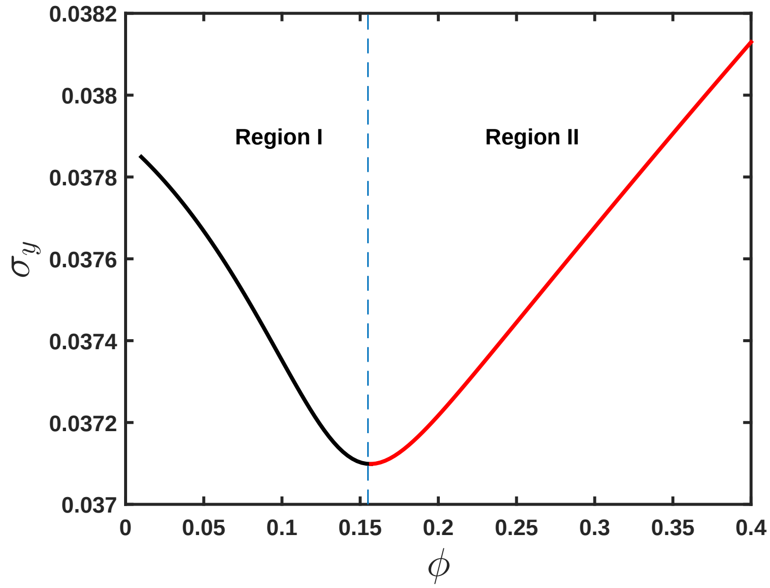


**Figure [illegible]: Financial Openness and Consumption Volatility**

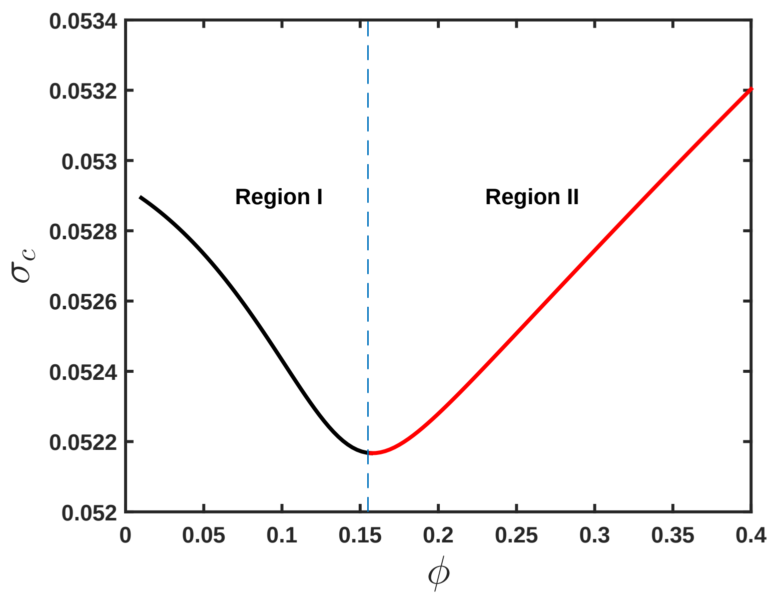


## Figure : Financial Integration and Output Volatility




Note: Axises denote the estimated value of $\phi$ and the standard deviation of output.

## Figure : Financial Integration and Consumption Volatility




Note: Axises denote the estimated value of $\phi$ and the standard deviation of consumption.

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**Figure    Financial Integration and Steady State Leverage**

**Figure [illegible]: Financial Development and Output Volatility**

data is reported at a higher frequency, the quarterly frequency is constructed as a simple average.

## Appendix B Timing

The timing of importers is:

where the aggregate borrowing and lending among households is zero, we can get

$$
\begin{aligned}
& C_t^m + p_t(C_t^d + X_t) \\
&= p_t Y_t^d + \Xi_t + \Omega_t \\
&= p_t Y_t^d + \underbrace{Y_t^m - {}_t^m q_{t-1} {}_{t-1}}_{\text{profit}} + \underbrace{(1-\gamma)\left[1-\Gamma(\bar{\omega}_t)\right] {}_t^m q_{t-1} {}_{t-1} - {}^e}_{\text{transfers}} \\
&= p_t Y_t^d + Y_t^m - \{
\end{aligned}
$$

Each period this economy borrows $B_t$ and pays back $^*_{t_1} B_{t-1}$. Then net exports are

$$
\begin{aligned}
X_t &= {}^*_{t-1}B_{t-1} - B_t \\
&= EX_t - I \quad _t \\
&= \underbrace{\quad _t + \quad {}^*_{t-1}B_{t-1}}_{\text{export}} - \underbrace{q_t \quad _t}_{\text{import}} \\
&= \underbrace{\quad _t + \quad {}^*_{t-1}B_{t-1}}_{\text{export}} - \underbrace{(\quad _t + B_t)}_{\text{import}} \\
&= {}^*_{t-1}B_{t-1} - B_t
\end{aligned}
\tag{C.5}
$$

Net worth $_t$ is

$$
\begin{aligned}
{}_t &= \gamma \left[1 - \Gamma(\bar{\ }_t)\right] {}^m_t q_{t-1} \quad _{t-1} + \quad ^e \\
&= \gamma \left[1 - \left[1 - F(\bar{\ }_t)\right]\bar{\ }_t - G(\bar{\ }_t)\right] {}^m_t q_{t-1} \quad _{t-1} + \quad ^e \\
&= \gamma \left[1 - \left[1 - F(\bar{\ }_t)\right]\bar{\ }_t - (1 - \quad )G(\bar{\ }_t) - \quad G(\bar{\ }_t)\right] {}^m_t q_{t-1} \quad _{t-1} + \quad ^e \\
&= \gamma \left[\left[1 - \quad G(\bar{\ }_t)\right] {}^m_t q_{t-1} \quad _{t-1} - \underbrace{\left[1 - F(\bar{\ }_t)\right]\bar{\ }_t \; {}^m_t q_{t-1} \quad _{t-1} - (1 - \quad )G(\bar{\ }_t) \; {}^m_t q_{t-1} \quad _{t-1}}_{R^*_{t-1}B_{t-1}}\right] + \quad ^e \\
&= \gamma \left[\left[1 - \quad G(\bar{\ }_t)\right] {}^m_t q_{t-1} \quad _{t-1} - \quad {}^*_{t-1}B_{t-1}\right] + \quad ^e
\end{aligned}
\tag{C.6}
$$

# Appendix D GMM Estimation

Because the dataset is an unbalanced panel, the estimator has to adjust for both autocorrelation and cross-correlation among countries. Therefore, I use Driscoll and Kraay (1998) estimator, which is a modification of the HAC estimator. The key input in the estimation is the set of $p$ moment conditions

$$M(\Theta) = \left[(1 \quad )\right]^T$$

The GMM estimator is

$$\hat{\Theta} = \text{argmin} \quad M(\Theta)' W M(\Theta) \tag{D.2}$$

I use a usual two step to estimate. The first step is to use a identity weighting matrix and the second step uses a optimal weighting matrix to reestimate the model.

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