

Contestability Approach to Financial Integration

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Perfect capital mobility assumption is a strong one made in many different economic contexts. Once capital is presumed to be free to move across borders, it is generally assumed that trade continues until arbitrage opportunities fade away, which brings equalization of asset prices across borders. But, in real life many asset prices, like interest rates, are far from being equalized among countries, especially during the financial crisis. First of all, countries are of different levels of risks and this affects cost of borrowing of different countries. Moreover, in some cases even if higher compensation is available, lending might be impossible for higher risk countries especially during the financial turmoil periods.

Although the literature generally focuses on the role of foreign investors during these financial instabilities, as it was indicated by Frankel and Schmukler (1996), the behavior of another player, domestic lenders are also of great importance in these markets. Our paper focuses on the behavior of domestic lenders in the presence or the absence of the foreign lenders in financial markets. In our model, the role of foreign players' is not only being the supplier of funds, but also being the player who introduces the competition to the market. Therefore, even if foreign lender is not actually lending to a specific country, the country in the sample might still benefit from the financial integration by having an entry pressure on domestic lenders. This approach is one to one related with contestable market approach which was introduced by Baumol etc (1982).

The Definition of Financial Integration and Contestable Markets

Financial integration is generally related to the removal of barriers to financial transactions. According to this definition, once a country removes the barriers, its get integrated. So, integration is perceived as a concept which stays constant once it is achieved. On the other hand, some authors do not see the integration unvarying. For instance, in Bekaert and Harvey (1995)'s CAPM type model, and integration is a time varying variable. For Freixas (2004), integration is not a permanent event. A country can sometimes experience segmentation and collapse integration is called financial crisis in this model.

The approach we are going to follow in this paper does not also see integration as a permanent event. Integration here is one to one related with the existence of the foreign competition. When there are entry barriers, we definitely have segmentation as in the simplistic approach. However, when there are no entry barriers you might still have segmentation if foreign lender can not enter the market for a reason other than barriers. Now, let's assume foreign lenders are experiencing difficulties in the markets they had borrowed before. The domestic lenders who realize this will see that they are the only lenders in the market. Whenever domestic lender has this feeling, it means that we do not have integration according to our definition. The domestic lender's perception about how their competitors will react is extremely important here. If domestic lender sees a potential for foreign lenders to enter the market, he would take the possibility of them undercutting the prices into account in his decision making.

This approach here assumes that if there is not entry or exit cost, foreign lender will enter the market and exploit the profit opportunities. However, when the global conditions are not favorable and/or specific foreign lender has financial loss in some other countries, or maybe the risks of investing in a specific country is too high, then this will decrease competition pressure from foreigners, so there won't be integration. The concept that we use here is related to contestable market approach. The pressure of the reversible free entry enforces socially optimum behavior, as we do have in domestic markets during the integration times. According to *contestability*, the threat of entry is a factor here which hold price below the profit maximizing level. The incumbent firm in this approach chooses a price which does not maximize its profit. So, limit price is the highest known price which in this context domestic lender believes they can change without inducing foreign lender's entry.

In the following section, we will introduce a model which discusses domestic lenders behavior in different environments and discusses the pricing behavior in integration and segmentation cases. The domestic lender's choice among two different pricing schemes is going to be examined here. The idea is simple. When the domestic lender feels the pressure of foreign investors, he will not be able impose his monopoly price. However, if, for some reason, domestic lender thinks that there is no possibility of foreigners to enter the market, he will be more relaxed and he will be able to use his

monopoly power this time. This will directly introduce the role of financial integration in the determination of domestic asset prices in the sense that the more integrated you are, the more you will feel the foreign lender's pressure, the more careful you will be in your pricing decision. This definition of integration establishes an additional role of integration. So, even if a foreign lender is not actually lending to a country, *so there is no supply side effect*, the discovery of foreign lender not being able to invest into a country will have some implications in terms of the domestic lender's behavior. Taking this one step further, we can assert that one of the foreign lenders' not being able to lend to a country will affect domestic and other foreign lenders' behavior and pricing decisions in the multiple foreign lender case.

For instance, assume that the foreign lender has only two investment opportunities. He can lend to the bank in country 1 and to a bank in his domestic country. If he lends to his own domestic borrowers the marginal cost of this lending will be only equal to R_2 . On the other hand, if he lend to country 1, he will face some additional costs related with information gathering, since he knows conditions related with his own country better than country 1. Therefore, the cost of lending to domestic country will be R_2+td , where d represents the distance between country 1 and country 2 and t is marginal cost of gathering information per unit of distance. As long as the foreign lender's benefit from lending to a bank in country 1 covers all these additional costs and this profit is greater than his profit from lending to a bank in his domestic country, this lending will be a possible alternative to him. So, there will be foreigner's pressure on domestic lender in this case.

In addition to this, now assume that the foreign lender thinks that there is an exchange rate cost related with lending to country 1. Although it is unrealistic, assume for the time being that lender exactly know the amount of depreciation he will be facing during his lending period, Δe . This will make the marginal cost of lending to country 1 will be $R_2^*+td+\eta\Delta e$ this time. As long as the return he will get covers this additional cost and his profit is still greater than his reservation profit, then domestic lender will still feel the pressure.

To simplify the idea, let's assume the depreciation can take only two different values, high Δe_H and low Δe_L . If it is still profitable to lend to country 1 when it is low,

and reservation profit is higher when it is high, then domestic lender will feel foreign lender's pressure. On the other hand, if we assume that when degree of depreciation is high, the profit offered to foreign lender country is less than the reservation profit, domestic lender will not have this pressure. Therefore, in this simple example, there is a change in the way of determination of θ depending on the magnitude of depreciation. That is to say, pricing regime will shift between monopoly and limit pricing depending on the magnitude of the exchange rate loss.

Model:

There are two countries $i=1,2$ in the model. First country has two and second country has only one bank in the system. Each bank collects deposit, D_i and channels this money into an illiquid investment project immediately. Each dollar in illiquid investment, I_i^1 , will bring in R_i , which is greater than 1, dollars to the bank at the end of the period. In order to simplify the model, we assume that there is no reserve requirement in this system for the time being². Therefore, banks facing liquidity shock and/or deciding to lend in the interbank market would need to liquidate its investment. If a bank liquidates ΔI_i , it has to give up the return for ΔI_i and just gets whatever he withdraws. Banks have to return $g_i D_i$ dollars to the depositors and have to pay θL at the end of this period where L represents the amount borrowed and $\theta > 1$.

There are two banks in country 1, one of which is in need of liquidity and the other is in the position of lender, and the bank in country 2 is in the lender position as well. Banks already made their investments onto illiquid projects and liquidity shocks have been already realized. One of the banks in the first country can be thought as having high level of liquidity shock and being in need of external liquidity. He can borrow from either domestic or foreign bank.

The demand side is therefore known to both lender banks. Domestic lender is aware of the other lender's marginal cost, which is assumed to be constant. Now let's assume that foreign lender does not have full information about country 1. Therefore, he waits for domestic lender to take action first. After observing the decision of the bank in

¹ This makes $I_i=D_i$.

² There is no central bank policy for the time being too.

country 1, which will be called domestic lender hereafter, he takes his action. Moreover, lending in the country 1 is not the only option to lender of country 2, foreign lender hereafter. He has different alternatives and lowest of those alternatives promise $\bar{\Pi}_2$ dollars of profit, which is *reservation profit*. In this scenario being in the position of leader gives tremendous advantages to domestic lender. He can arrange his supply in such a way that foreign lender only earns $\bar{\Pi} - \varepsilon$ dollar profit at the existing price level. Therefore, foreign lender has no reason to enter this market.

Demand Side:

Since the demand shock has already been realized, banks have full information about the liquidity demand function. More specifically, banks observe following demand functions

$$\theta = a - bL$$

where $L = L_F + L_D$.

Supply Side:

a. Domestic Supplier

The domestic lender's profit is given below

$$\Pi_1 = (I_1 - \Delta I_1)R_1 + \theta L_1 - (1 - \lambda_1)g_1 D_1$$

and we know that $\Delta I_i = L_i + \lambda D$

where λ represents the percentage of liquidity demand that bank 1 faced at the end of the previous period. So, bank finances liquidity withdrawals together with money to be lent through liquidating his illiquid investment projects³.

b. Foreign Supplier:

The foreign lender has bear two different types of costs in lending to country 1. On the one hand he gives up the return he would get from the illiquid investment, R_2 . On the other hand, there are specific costs related to the lending to country 1. As in trade

³ Here $(1 - \lambda_i)g_i D_i$ represents the amount being paid by bank to his patient depositors who wait until the end of deposit's maturity.

literature, in this part we will assume that there is an iceberg cost of lending to the other country. In other words, some part of the return lost or melted during the lending process. We will below assume that the magnitude of this newly introduced cost can take two values, high and low, to simplify the model.

The profit function of foreign lender now becomes

$$\Pi_2 = (I_2 - \Delta I_2)R_2 + (\theta - \gamma_j)L_2 - (1 - \lambda_2)g_2D_2 \quad j=H, L$$

where λ_2 represents the percentage of liquidity demand that bank 2 faced at the end of the previous period, γ_H and γ_L represents high and low iceberg costs respectively.

Now, let's examine the case of $\gamma = \gamma_L$. The transaction costs are really low and foreign lender is assumed to earn more than his reservation profit in this case. Therefore, there is an entry pressure from foreign lender, which makes domestic lender be careful about his pricing decision. He will check his profit in two different cases, the profit when he allows the foreign lender to enter the market and the profit that he does not allow. If he thinks that preventing foreign lender from entering into the market is better for him, he will do so. This case will be called *limit pricing case*.

However, when $\gamma = \gamma_H$, the transaction costs are high and the profit offered to foreign lender is less than his reservation profit. So, there is no way for foreign lender to gain higher profit than his other alternatives, which makes the domestic lender the only lender in the market. This case will be called *monopoly case*.

*Case 1: Limit Pricing*⁴

Foreign lender observing L_D^{LM} dollars of supply from domestic lender will have following profit function

$$\Pi_2 = (I_2 - L_F - \lambda_2 D_2)R_2 + (a - bL_D^{LM} - bL_F - \gamma_L)L_F - (1 - \lambda_2)g_2D_2 \quad (1)$$

He will maximize this profit by taking the domestic lender's supply as given. From his first order conditions we will have

$$L_2 = \frac{a - R_2 - \gamma_j - bL_D^{LM}}{2b} \quad (2)$$

By plugging (2) into (1), we can calculate the maximized profit of the foreign lender.

⁴ For details of limit pricing see Freidman (1983)

$$\Pi_2^* = (D_2 - \frac{a - R_2 - \gamma_L - bL_D^{LM}}{2b} - \lambda_2 D_2) R_2 + (a - bL_D^{LM} - \frac{a - R_2 - \gamma_L - bL_D^{LM}}{2b} - \gamma_L) (\frac{a - R_2 - \gamma_L - bL_D^{LM}}{2b}) - (1 - \lambda_2) g_2 D_2$$

If domestic lender can choose L_D^{LM} which makes $\bar{\Pi}_2 - \varepsilon = \Pi_2^*$, then he will be the only lender in this market. Now, let's make a few definitions which will be used in the calculation of L_D^{LM}

$$\Delta = [(2a - 2R_2)^2 - 4bX]^{1/2} \geq 0 \text{ where}$$

$$X = 4(D_2((1 - g_2)R_2 - (1 - \lambda_2)g_2) - \bar{\Pi} + \varepsilon) + \frac{R_2^2 + a^2 + \gamma_j^2 - 2a(R_2 + \gamma_j) + 2R_2\gamma_j}{b}$$

$$L_{D_1}^{LM} = \frac{2(a - R_2 - \gamma_L) + \sqrt{\Delta}}{2b} \quad (3)$$

$$L_{D_2}^{LM} = \frac{2(a - R_2 - \gamma_L) - \sqrt{\Delta}}{2b} \quad (4)$$

At the existing price level, what we need is foreign lending to be exactly equal to zero, not a negative or positive number. If the domestic lender supplies the amount indicated in equation (3), then foreign lending will be a negative

magnitude, $L_{F_1} = \frac{a - R_2 - \gamma_L - bL_{D_1}^{LM}}{4b} = \frac{-\sqrt{\Delta}}{4b} < 0$. So, $L_{D_1}^{LM}$ and L_{F_1} does not satisfy this

condition. However, if domestic lending is equal to the quantity in equation (4), then foreign lender is going to supply

$$L_{F_2} = \frac{a - R_2 - \gamma_L - bL_{D_2}^{LM}}{2b} = \frac{\sqrt{\Delta}}{2b}$$

By imposing some restrictions, it is possible to make this quantity equals to zero. That is, for $L_{F_2} = 0$, we need

$$\sqrt{\Delta} = 0 \quad (5)$$

After excluding equation (3) from the set of solutions, we can conclude that when domestic lender supplies $L_D^{LM} = \frac{2(a - R_2 - \gamma_L) - \sqrt{\Delta}}{2b}$, the resulting price will be

$$\theta = \frac{2\gamma_L + 2R_2 + \sqrt{\Delta}}{2} = \gamma_L + R_2$$

Case 2: Monopoly Case

Now let's assume $\gamma = \gamma_H$. In this scenario, $\Pi_2^* < \bar{\Pi}$. Domestic lender knows foreign lender has better alternatives outside. So, there is no entry pressure. This will give the following profit function to the domestic lender

$$\Pi_1 = (I_1 - \Delta I_1)R_1 + \theta L_1 - (1 - \lambda_1)g_1 D_1$$

Being in the position of the monopoly makes the domestic lender supply the following quantity:

$$L_1 = \frac{a - R_1}{2b}$$

The price level in this case will be the following expression

$$\theta_m = \frac{a + R_1}{2}.$$

Therefore, depending on the magnitude of the transaction costs, we have two different regimes determining the value of domestic prices of interbank lending.

Different Regimes in the Determination of Interbank Market Rates

To sum up, there are two different value of θ in this model.

1. If $\gamma = \gamma_L$, then $\theta_L = \gamma_L + R_2$
2. If $\gamma = \gamma_H$, then $\theta_m = \frac{a + R_1}{2}$

In this setup, the value of γ changes exogenously and the extent of the cost is known completely. Although these assumptions are clearly unrealistic, we do not introduce some uncertainties into the model for the time being, we can use the insight here to formulate our model. Now, let's assume in a more realistic case, the values of θ is determined by the two following equations:

1. If $\gamma = \gamma_L$, then $\theta_{L_t} = \beta_0 + \beta_1 \gamma_{L_t} + \beta_2 R_{2_t} + u_{1_t}$ (6)
2. If $\gamma = \gamma_H$, then $\theta_{m_t} = \phi_0 + \phi_1 a_t + \phi_2 R_{1_t} + u_{2_t}$ (7)

Then,

$I_t=1$ if θ_t comes from the first regime

$I_t=0$ if θ_t comes from the second regime

Apparently, this formulation requires us to observe the indicator. Since we do not observe it, we can define another equation which relates it to a latent variable, assuming that we know the determinants of the indicator. If those variables are X_{1t} and X_{2t} and we know that we have a linear relationship, we can define a variable Z_t

$$Z_t = \delta_o + \delta_1 X_{1t} + \delta_2 X_{2t} + u_{3t}$$

$$I_t = 1 \text{ if } Z_t > \bar{Z}$$

$$I_t = 0 \text{ otherwise}$$

As long as we have $\text{cov}(u_{1t}, u_{3t}) = \text{cov}(u_{2t}, u_{3t}) = 0$, we would have a switching regime regression with *exogenous switching*. We can estimate (5) and (6) by OLS. But if $\text{cov}(u_{1t}, u_{3t}) = \text{cov}(u_{2t}, u_{3t}) \neq 0$, we have endogenous switching and (5) and (6) can not be estimated by OLS.

By reformulating the model, we can reach the following equation:

$$\theta_t = \beta_0 + \beta_1 \gamma_{L_t} + \beta_2 R_{2t} + I_t (\phi_0 + \phi_1 a_t + \phi_2 R_{1t}) + w_t$$

In the next section, we will introduce the estimation results for three developing countries. They all recently experienced a financial crisis. The country in the foreign lender position is Germany. We have monthly interbank money market rates for 1990M1-2003M12 period. So, countries in our sample experienced financial crisis at least one time in our estimation period.

Estimation Results

In this part of the paper, we will present the estimation results. Table 1 below gives the definition of the variables and coefficients' expected signs.

Table 1: Signs and Definitions

variable	definition	Expected sign
production	Country 1's output variable	
gproduction	Country 2's output variable	-
ldistance	Variable proxy for asymmetric information	+
glexc	Exchange rate cost	+
deposit	Cost of domestic lending	+
gdeposit	Foreing lender's cost of lending	+
c	constant	

Table 2: Panel Data Regression Results

variable	Coefficients	St error
production	-.4183771	.2620409
gproduction	-.9999481	.5059
ldistance	9.518513	4.942371
glexc	-3.235153	1.740445
deposit	1.190336	.1202598
gdeposit	1.86754	1.639562
c	44.0908	29.83516

Conclusion

As it can be seen from the table, most of the time coefficient estimates have the expected sign. On the other hand, some of the magnitudes are really higher than expected. One possible reason for this is that the equations here are very basic and it just tests the variables included into the model. However, this version of the model is far from reflecting the reality right now. For example, we do not have the demand side here. In addition to this, the panel that we have here has small dimension. Although we have pretty long time span, the individual dimension of the panel needs to be enriched.

References

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