International Policy Coordination for Financial Regulation with Politically Influential Banks

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Abstracts: This paper examines the conditions for effective financial regulatory policy coordination considering the cross-border externalities caused by multinational banks and the political influences exercised by banking sectors. We demonstrate that when the banking sectors are inefficient with higher loan monitoring costs, the regulatory efforts becomes strategic substitutes between financial regulators, and therefore, the financial regulator of each country tends to exert less regulatory efforts with higher incentives to free ride other countries' regulatory efforts. Higher asymmetries of banking sectors' political influences increase the free riding incentives further. Therefore, given strategic substitutability of regulatory policies, the international financial regulatory policy coordination mechanism should be introduced with relatively homogeneous countries with far-sighted policy perspectives. In case banking sectors shows higher efficiency with lower monitoring costs, the regulatory efforts are strategic complements with lower incentives to free-ride. However, over-sensitive responses to other countries' policies tend to cause financial instability with multiple equilibria, and necessitate the introduction of international coordination mechanism even if regulators do not have free riding incentives.

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1. Introduction

After the onset of the latest global financial crisis, which was initiated by the collapse of US mortgage loan markets in 2007, the importance of international policy coordination for financial market regulation has been emphasized as a prerequisite to restrain the contagion of financial crisis. The effective financial coordination became a critical issue since the US financial crisis had caused the collapse of the global financial system and real economies at the global level in an unprecedented speed with little effective international policy coordination to restrain the spill-over effect of the crisis.

The latest experience of the global financial crisis confirmed the fact that a well-organized international policy coordination mechanism is essential for effective renovation of financial systems due to the cross-border externalities caused by the multinational financial intermediaries. Motivated by the latest experiences of the cross-b0rder contagion of financial crisis, this paper examines optimal international policy coordination mechanism in financial regulation considering strong cross-border externalities in financial regulation and monitoring efforts via the multinational banking sectors. Moreover, we focus on how the asymmetric decision making process of the financial regulatory policies influences the effectiveness of the international policy coordination mechanism for financial regulation.

It is widely believed that the most important factor for the latest financial crisis in 2008 is the wide-spread moral hazard among the issuers of mortgage loan and the mortgage-backed securities (MBS) without proper monitoring efforts. Moreover, the moral hazard was wide-spread even among the financial regulators that are politically

influenced and sometimes captured by the banking sectors and the unscrupulous financial sectors such as investment banks and commercial banks that have invested heavily on toxic assets such as the non-performing MBS.

Therefore, a comprehensive approach to design a financial mechanism to contain recurrent financial crisis should handle the mal-functioning banking regulation that is influenced by the banking sectors' lobbying efforts, especially taking consideration of the strong cross-border financial externalities due to multinational banking sectors. The main feature of negative cross-border externalities takes the form of strong incentives to free ride financial regulatory efforts of other countries as observed in case of improper regulatory efforts of toxic assets in a country and the reserved attitude to introduce the regulation against speculative financial traders.

Based on the above backgrounds, this paper examines the conditions for the effective international policy coordination in financial regulation under strong cross-border externalities in financial regulation and banking sectors' monitoring efforts due to multinational banking operations. We determine when financial regulators have a higher incentive to free ride the other country's regulatory efforts focusing on different levels of banking sectors' monitoring and asset management efficiency. In addition, we examine the impact of the asymmetric political influences of banking sectors between coordinating countries.

This paper examines the conditions for self-enforcing international policy coordination mechanism for financial regulation integrating the consideration of the cross-border externalities caused by multinational banking and asymmetric political influences of banking sectors in each country. We consider two countries with each

representative banking sector which operates as a multinational bank in both countries.

Each government regulates her representative bank that operates in both home and foreign markets by determining capital adequacy requirements. The government regulation on capital adequacy requirements eventually determines the size of loans made by the banks given the amount of equity. Each banking sector decides the level of monitoring efforts to reduce non-performing loans after observing the government regulation, and the aggregated monitoring efforts of the domestic bank and the foreign bank eventually decides the level of financial stability reflecting the cross-border externality of the multinational banks.

Given these environments, we demonstrate that when banking sectors' monitoring costs are higher than the critical level, the financial regulatory policies are strategic substitutes between regulators, and each regulator has strong incentives to free ride other regulators' regulatory efforts. When financial regulatory efforts are strategic substitutes, the incentives to free ride the regulatory efforts of other countries are increased as policy makers are more short-sighted and the asymmetry of banking sectors' political influences are increased. In addition, we show that when policy makers are far-sighted with homogeneous political economic systems in terms of homogeneous banking sectors' political influences, an introduction of policy coordination mechanism can effectively reduce the incentives to free ride other countries' regulatory efforts.

More specifically, when the asymmetry of political influences of banking sectors is lower than the critical level and policy continuity of policy makers are higher than the critical level, the self-enforcing condition for effective coordination is satisfied with a simple introduction of international financial coordination mechanism itself. Moreover, it is shown that although banks benefit from financial stability, the politically influential bank prefers a regulatory policy, which might lower the financial stability with lower capital adequacy requirement.

These results imply that international policy coordination for financial regulation is feasible among relatively homogeneous countries with political stability, with a high discount factor, by inaugurating the coordination mechanism under the

format of repeated coordination game. In other words, the introduction of an international financial policy coordination mechanism should start among relatively homogeneous countries in the initial stage. In the same spirit, countries with relatively homogenous political economic structure should play the leading roles for financial policy coordination such as in recent discussion for various formats of international financial policy coordination including G20, and other regional coordination efforts.

We also demonstrate that when the banking sectors' monitoring costs are lower than the critical level, the regulatory efforts are strategic complements, and therefore, financial regulators do not have incentives to free ride other countries' regulatory efforts. Nonetheless, the strategic complementarity of regulatory policies is the source of the uncertainty of the regulatory regime due to multiple equilibria of regulatory regime. Therefore, we show that even if regulators do not have incentives to free ride the other countries' regulatory efforts when regulatory policies are strategic complements, the introduction of international financial policy coordination mechanism is required to reduce the financial instability due to the multiple equilibria of financial regulatory regimes.

Numerous studies, including Stolz (2002), Aghion et al. (2007), Kohler (2002), Dalen and Olsen (2004), have investigated the optimal mechanism of banking regulation in the presence of cross-border lending. Stolz (2002) examines the optimal design of banking supervision in the presence of cross-border lending, and argues that if supervisors are accountable only to their own jurisdictions, they fail to implement the optimal level of supervision from a supranational perspective, and consequently, the probability of bank failures is significantly increased. Aghion et. el. (2007) showed that when policy makers are heavily influenced by domestic interest groups, the global policy coordination cannot be achieved.

Assuming an overlapping generation model of two countries with a homogeneous, non-storable consumption good, Chang (1997) demonstrated that financial integration might deteriorate the welfare under non-cooperative policymaking regime. In addition, Kohler (2002) shows that positive spillovers of the coalition formation process and the resulting free-rider problem limit the stable coalition size, and increases the incentives to deviate from the coalition.

Dalen and Olsen (2004) analyze the optimal policy coordination mechanism focusing on the impacts of cross-border banking and entry of multi-national banks (MNBs) for banking supervision and regulation. They show that the improper international coordination mechanism for regulation on MNB-subsidiaries lowers capital adequacy requirements. In addition, policy coordination issues were determined to be the primary factor governing welfare efficiency of a wide range of policies when international externalities are observed, as shown by Angeletos and Pavan (2007), Morris and Shin (2002), Loisel and Martin (2001), Jensen (1999), and Botman and Jager (2002). Dell'Ariccia and Marquez (2006) showed that centralized regulation is more likely to emerge among relatively homogeneous jurisdictions and entails standards higher than those of the country with the highest individual standards.

This paper contributes to the earlier body of literatures by determining the conditions for financial regulators' higher incentives to free ride the other countries' regulatory efforts. We demonstrate that when financial regulatory policies are strategic substitutes with banks' monitoring costs higher than the critical level, financial regulators have strong incentives to free ride other countries' regulatory efforts. The economic intuition behind this finding is that the strict financial regulation with higher capital adequacy requirements imposes higher costs to the inefficient banking sectors with higher monitoring costs. Therefore, financial regulator has higher incentives to free ride other countries' regulatory efforts due to cross-border externalities. Our finding that

the financial policy coordination mechanism can be sustained effectively among relatively homogeneous countries is consistent with the results in Dell'Ariccia and Marquez (2006), while they did not examine the condition for strategic substitutability of financial regulatory policies.

Moreover, we demonstrate that when financial regulatory policies are strategic complements with the banking sectors' monitoring costs lower than the critical level, financial regulators do not have the incentives to free ride other countries' regulatory efforts, which was not discussed in earlier literatures. Nevertheless, we show that it is required to introduce the international financial policy coordination mechanism to reduce financial instability due to the multiple equilibria of regulatory regimes even if financial regulators do not have the incentives to free ride with strategic complementarity of regulatory policies.

This paper is organized as follows. Section 2 introduces the model and Section 3 examines the equilibrium of international financial policy coordination when regulators have incentives to free ride other countries' regulatory efforts with strategic substitutability of regulatory policies. Section 4 shows that the introduction of financial policy coordination is required even if banking sectors do not have free riding incentives when regulatory policies are strategic complements, and Section 4 discusses the policy implications of the results and concludes.

2. Model

We consider two countries, domestic and foreign countries, with a representative bank in each country, operating as a multinational bank in both domestic and foreign markets. The financial supervisor in each country regulates banks operating in her territory by deciding the capital adequacy requirement ratio given her policy objective function, which is a weighted summation of the banking sector's utility and the public sector's utility represented by the financial stability of the country.

After observing the decision of the financial regulator, the representative banking sector in each country decides how to allocate her loans between the domestic market and foreign market as well as her monitoring efforts level over her loans. The financial stability of the country is decided by the aggregate monitoring efforts of the domestic bank and the foreign bank to minimize the risky loans. For the simplicity of the analysis without loss of generality, the banking sectors' aggregate monitoring efforts level is interpreted as the level of financial stability that determines the final rate of return from loan making.[1] First, we examine the case of one-shot game where each policy maker employs a non-cooperative Nash strategy, which can be interpreted as the case where each government takes a short-sighted policy approach.

A representative banking sector operating both in the domestic and the foreign markets has two strategic variables such as monitoring efforts over risky loans that it extends to borrowers and the allocation of loans between domestic and foreign markets. The rate of return from loan making in country i is given as follows, taking the form of an inverse demand function of loans:

$$r_i = \overline{r}_i - (L_{ii} + \lambda L_{ji}) = \overline{r}_i - (\frac{\theta_i E_i}{k_i} + \frac{\lambda(1-\theta_j)E_j}{k_i}) \tag{1}$$

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[1] The financial regulator in each country regulate both domestic banks and foreign banks operating within domestic market, while domestic banks operating in the foreign market is regulated by the foreign financial regulator. Therefore, when a banking sector decides the allocation of loans and the level of monitoring efforts, the regulatory policies of the foreign country is considered in her profit maximization process. Since the foreign regulatory policies are already reflected in the domestic banking sector's decision on the monitoring efforts, even if we assume that the banking sector makes different monitoring efforts in different markets, it does make significant qualitative difference in the results from those based on the current assumption that each banking sector makes symmetric monitoring efforts in both markets reflecting two countries' regulatory policies.

where L_{ji} is the loan made by bank j in country i, while λ is the coefficient representing the level of financial market integration.[2] More specifically, the amount of money loaned by bank j in market i, is defined as follows: $L_{ji} = \dfrac{(1-\theta_j)E_j}{k_i}$ where θ_j is the share of the loan made in market j by bank j. E_j is the level of equity procured by bank j. k_i is the capital requirement ratio imposed by the financial regulator in country i, $k_i = \dfrac{E_i}{L_i}$, where E_i represents the equity level of bank i, and L_i represents the amount of money loaned by the representative bank in country i.[3]

Bank i tries to maximize her profits by deciding her loan portfolio between the domestic market and the foreign market as well as her level of monitoring efforts for risky loans with the profit function defined as follows:

$$\underset{q_i,\theta_i}{Max}\prod_i = (q_i + \gamma_{ji}q_j)r_iL_{ii} + \mu(q_j + \gamma_{ij}q_i)r_jL_{ij} - c_iq_i^2 \tag{2}$$

such that $\quad (q_i + \gamma_{ji}q_j)r_iL_{ii} + (q_j + \gamma_{ij}q_i)r_jL_{ij} - c_iq_i^2 \geq \delta_iD_{ii} + \rho_iE_{ii} + \delta_jD_{ij} + \rho_jE_{ij} \tag{3}$

where q_i is bank i's monitoring efforts level to minimize the risky asset. The aggregate monitoring efforts level of the banking sector including the cross-border impact of foreign bank's monitoring efforts, $q_i + \gamma_{ji}q_j$, decides the domestic financial stability, and the final rate of return from domestic loan making, where γ_{ji} represents the cross-border externality of foreign bank j's monitoring efforts on domestic financial stability in country i.[4] With the cross-border financial externalities due to multinational

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[2] $\lambda \in [0,1]$. When the domestic government prohibits foreign banks make loan in the domestic market, $\lambda = 0$. If the financial market is fully integrated with no restriction on the foreign banks, $\lambda = 1$.

[3] The representative banking sector has two strategic variables to maximize the banking sector's profits such as the monitoring effort level to minimize risky assets and the allocation of the available funds among the domestic market and the foreign market. When the financial regulator increases the capital requirement ratio, the representative bank should reduce the amount of risky loans, eventually reducing the total amount of loan given the total amount of equity of the bank. Therefore, the increased rate of return from loan making further induces the higher level of monitoring efforts by the representative banking sector. Since we target to examine the impact of cross-border externalities of financial regulation, we do not introduce other investment opportunities for the banking sector that are free from the influence of the financial regulator.

[4] $(q_i + \gamma_{ji}q_j) \in [0,1]$. When there is no financial instability, there is no non-performing loan with

banking operation, the financial stability of the domestic country is influenced by the foreign financial monitoring efforts by the scale of γ_{ji}.[5] 'μ' is the parameter representing the level of capital market integration, with the lower 'μ' representing the higher capital market barriers such as the restriction of profit transfer from host country j to home country i.[6] The cost of banking sector's monitoring efforts takes the quadratic form, $c_i q^2$, where c_i is the monitoring cost parameter of bank i, representing the banking sector i's efficiency.

Based on equation (1), the profit function of the banking sector can be also represented as follows:

$$\underset{q_i, \theta_i}{Max} \prod_i = (q_i + \gamma_{ji} q_j) r_i \frac{\theta_i E_i}{k_i} + \mu(q_j + \gamma_{ij} q_i) r_j \frac{(1-\theta_i) E_i}{k_j} - c_i q_i^2 \qquad (4)$$

The liquidity constraint is given as equation (3), where the left-hand side term of the inequality is the liquidity available as profits of the banking sector, while the right-hand side is the payment requirement. D_{ii} is the amount of the deposit that bank i receives in country i while δ_i is the cost involved with raising deposits, while ρ_i is the parameter showing the cost of raising its own equity, i.e., the cost of capital formation. Therefore, the total amount of payment requirement is the summation of the payment requirement for the deposit, and the cost of the capital formation in the domestic country and the foreign country. When the liquidity constraint is not satisfied, the representative banking sector faces the bankruptcy, and the financial system and the

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$(q_i + \gamma_{ji} q_j) = 1$. When the financial stability is deteriorated to the worst case, all loan made by the bank become non-performing loan with $(q_i + \gamma_{ji} q_j) = 0$, implying the banking sectors' assets become junk assets with no return retrieved.

[5] The cross-border externalities of monitoring efforts on domestic financial stability are created by the multinational banking operation in this model. However, we might assume that the cross-border externalities, γ_{ji}, includes psychological cross-border contagion effects that are often discussed in behavioral finance literatures.

[6] The level of financial market integration and the resulted cross-border externalities were introduced in this model reflecting different sources of policy measures. 'μ' shows the level of free transfer of the profits made in the foreign markets. Since the main driving force of this paper is to find the optimal mechanism for sustainable coordinating mechanism for financial policies, we'll focus on the issue of cross-border externalities of financial stability assuming full financial market integration in other respects as μ=1, and λ=1.

financial stability is assumed to be collapsed.[7]

The objective function of the country i's financial supervisor is defined as a weighted summation of the utilities of the banking sector, the profits of the banking sector, and the utilities of the public that is dependent on the financial stability.[8]:

$$\underset{k_i}{Max}\, W_i = \alpha_i \prod_i (L_i, L_j) + \beta_i (q_i + \gamma_{ji} q_j) \tag{5}$$

where α_i is the coefficient representing the political influences commanded by the banking sector of country i while β_i is the coefficient representing the political concerns about the public utility represented by the financial stability of society as a whole. If α_i is relatively higher than β_i, the financial supervisor is captured by the banking sector, giving higher political importance to the banking sector's profit than to general social welfare represented by the financial and economic stability. [9]

The structure of the game can be summarized as follows: The financial supervisor in each country decides financial regulatory policy, i.e., the capital adequacy requirement, to maximize the policy objective function, which is the weighted summation of the utilities of the banking sector and the public utility, i.e., the financial stability of the economy. After observing the government decision, the representative bank in each country maximizes her profits from the multinational banking operations

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[7] The government policy interventions to resolve the bankrupt financial sectors are not considered in this model since we focus on cross-border externalities and resulted financial coordination issues. Moreover, the liquidity constraint of each representative banking sector is assumed to be satisfied in this paper since the parameters in liquidity constraint do not directly affect the coordination mechanism over cross-border externalities in financial markets.

[8] The stability of domestic financial market is decided not only by the domestic banking sectors' monitoring efforts, but also by the foreign bank's monitoring efforts by the rate of externalities reflected by the parameter γ.

[9] Dell'Ariccia and Marquez (2006), which is closest to this paper in terms of model setting, sets the weight on the financial stability in the policy objective function as $(1-\alpha)\beta$ assuming that β is a scaling factor of the financial stability. However, we simplify the weight given to the financial stability to β instead of $(1-\alpha)\beta$ to focus on the different political economic weight given the banking sector's profits and public interests related to the financial stability of the economy.

The banking sector's profit is positively affected by the financial stability of the economy. However, the optimal level of financial regulation on the capital adequacy requirement that maximizes the social welfare is higher than the level of capital adequacy requirement that maximizes the banking sectors' profits. Therefore, as α_i is higher, the optimal k^* is lowered, eventually lowering the level of financial stability, $q_i + \gamma_{ji} q_j$ as shown in Proposition 2.

in domestic and foreign countries with respect to two strategic variables: the allocation of loan-making between home and foreign markets and the bank's monitoring efforts level to reduce the risky assets.

3. Policy coordination for financial regulation with strategic substitutability of regulatory policies

When there are cross-border externalities in financial market stabilities, international policy coordination is required to internalize the cross-border externalities. Given cross-border externalities in the financial markets, if financial regulatory policies as capital adequacy regulations of involved countries have the property of strategic substitutability, each country has an incentive to free ride the regulatory efforts of other countries. Under the strategic substitutability of the financial regulatory policies, each country has an incentive to free ride other countries' regulatory efforts, and therefore, international policy coordination mechanism is required to prevent the under-provision of regulatory efforts for financial stability.

However, if financial regulatory policies have strategic complementarity with countries of cross-border externalities, financial regulatory policies of a country will be complemented with the regulatory efforts of other countries under cross-border externalities. Therefore, each country has no incentive to free ride the regulatory efforts of neighboring countries, and henceforth, the explicit arrangement for international policy coordination mechanism for cooperative regulatory measures is not required to prevent the under-provision of the regulatory efforts for financial stability.

Nonetheless, strategic complementarity of the financial regulatory policies involves another problem of economic uncertainty caused by multiple equilibria in financial regulation under complete information. In other words, both cases of under-provision of regulatory efforts and over-provision of regulatory efforts by involved countries can be equilibria as multiple equilibria. Conditions for each type of equilibrium are examined in the next section.

First, we define the market equilibrium when each policy maker makes a decision in a non-cooperative Nash equilibrium fashion via backward induction. A bank decides the loan allocation between foreign and domestic markets, and then it makes a decision about its level of monitoring efforts. The optimal level of monitoring efforts by each bank is given from the first order condition of the bank's profit maximization problem as follows[10]:

$$\frac{\partial \prod_i}{\partial q_i} = 0 \quad \rightarrow \quad q_i^* = \frac{E_i}{2c_i}\left(\frac{r_i\theta_i}{k_i} + \frac{\mu\gamma_{ji}r_j(1-\theta_i)}{k_j}\right) \tag{6}$$

The bank then decides on its allocation of the loans between two markets to maximize its profits. The optimal allocation of the loan is determined from the following first order condition, which is a function of the level of optimal efforts as given above.

$$\frac{\partial \prod_i(q_i^*)}{\partial \theta_i} = 0 \quad \rightarrow \quad \theta_i^* = \frac{k_i(2c_ik_jq_j(\mu r_jk_i - \gamma r_ik_j) + E_i\gamma\mu r_j(\gamma\mu r_jk_i - r_ik_j)}{E_i(r_ik_j - \gamma\mu r_jk_i)^2} \tag{7}$$

Considering the equilibrium values of each banking sector's strategic variables, the financial regulator in each country decides the capital requirement ratio, k_i.[11] When the policy maker takes a short-sighted approach and thus takes no consideration of policy continuity over the future regimes, the regulator makes a decision as a one-shot non-cooperative Nash equilibrium strategy. The financial regulator's objective function with a short-sighted policy horizon is defined as a non-cooperative game maximizing her own welfare given the competitor's strategy as follows:

$$\underset{k_i}{Max}\, W_i(k_i,k_j) = \alpha_i \prod_i^*(k_i,k_j) + \beta_i\left(q_i^*(k_i,k_j) + \gamma q_j^*(k_i,k_j)\right) \tag{8}$$

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[10] The banking sector is assumed not to make separate monitoring efforts between the home and foreign markets, but to make a single decision for the monitoring level in both markets taking consideration of two countries' regulatory policies to focus on the role of the banking sectors' different efficiency levels, i.e., the different monitoring costs.

[11] The regulation of the capital requirement ratio can be interpreted as a form of general financial supervision including the forward looking criteria of financial institutions' asset management.

However, when the policy maker takes a long-term approach and therefore, the discount factor of the policy maker is relatively high, the policy maker takes an approach to choose a cooperative strategy derived from the joint-welfare maximization problem defined as follows:

$$\underset{k}{Max}\left(W_i(k,q_i^*,q_j^*)+W_j(k,q_i^*,q_j^*)\right)=\underset{k}{Max}\left(\alpha_i\prod_i^*(k)+\beta_i\left(q_i^*(k)+\gamma_{ji}q_j^*(k)\right)+\alpha_j\prod_j^*(k)+\beta_j\left(q_i^*(k)+\gamma_{ij}q_i^*(k)\right)\right)$$

From the comparative static analysis of the optimal monitoring efforts level and the equilibrium welfare under a non-cooperative regime, cross-border externalities of the financial regulation are determined as summarized in Lemma 1. [12]

Lemma 1. *Each country's financial regulation policy creates positive externalities in that a higher capital adequacy requirement of a country increases the monitoring efforts of the other country's banking sector*.

Proof: From the comparative static analysis of optimal monitoring efforts, q_i^*, and the equilibrium social welfare with respect to the other country's regulatory policy, the positive externality is shown straightforwardly as follows:

$$\frac{\partial q_j^*}{\partial k_i}=\frac{E_j\mu\gamma_{ij}(1-\theta_j)\left(2\left(\theta_iE_i+\lambda(1-\theta_j)E_j\right)-\overline{r}k_i\right)}{2ck_i^3}>0 \tag{9}$$

Therefore, the financial regulatory policy has a positive cross-border externality on the foreign financial stability. □

When there is the positive cross-border externality in the financial regulatory policies, it is required to consider the strategic interaction of each country's financial

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[12] The positive externality is determined in such a way that more prudent financial regulation of a country enhances the representative bank's monitoring efforts of another country and welfare of the country. Whether a bank's increased monitoring efforts of a country's will enhance the monitoring efforts of the representative bank's monitoring efforts of another country as a strategic complement or replace the monitoring efforts of other banks' monitoring efforts depends on the assumption of the strategic characteristics of monitoring efforts of competing banking sectors. The assumption of the cross-border spillover effects of financial stability implies strategic complementarity of the monitoring efforts of competing banking sectors.

regulatory policies. Especially, strategic complementarity or strategic substitutability of the each country's financial regulatory policies makes a big difference in the international policy coordination mechanism. When the strategic properties of financial regulatory policies are characterized by strategic substitutes, each country prefers to free ride the other country's financial regulatory efforts taking advantage of the positive spillover effects of the other country. However, when financial regulatory policies take the property of strategic complementarity, international coordination over financial regulatory policies become somewhat involved although free riding incentives are removed, in contrary to the case of strategic substitutability.

In case of strategic complementarity of financial regulatory policies, there might be multiple policy coordination equilibria under complete information about the payoffs from each policy choice. In this case, explicit coordination mechanism is required to prevent a serious uncertainty caused by the multiple equilibria in international policy coordination. If we consider the possible informational barriers including the noisy signals between coordinating countries, a unique equilibrium of policy coordination can be achieved, while multiple equilibria are unavoidable under complete information given strategic complementarity of regulatory policies as demonstrated in general global game theoretic literatures.[13]

Now, we examine the conditions for strategic substitutability and strategic complementarity given the current setting of financial regulation of capital requirement ratio, or capital adequacy ratio regulation. From checking the cross partial derivative of the social welfare function with respect to each country's regulatory policy variables, we can determine the strategic substitutability and strategic complementarity. It is shown that when loan monitoring cost of banking sectors is higher than the critical value and foreign bank's equity is relatively lower than the domestic equity size, and the level of international financial market integration is lower, it is more likely that the financial regulatory policy, i.e., the capital adequacy ratio regulation, has the property of strategic substitute and vice versa.

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[13] The seminal paper by Carlsson and Van Damme (1993) shows how multiple equilibria with strategic complements can be refined to a unique equilibrium with the introduction of noisy signal.

Proposition 1. *When the loan monitoring cost of banking sectors, c, is higher than the critical value and E_j, a foreign bank's equity, is relatively lower than E_i, the domestic bank's equity size, it is more likely that the financial regulatory policy, i.e., the capital adequacy ratio regulation, has the property of strategic substitute. Moreover, given $c > T$, when the international financial markets are more integrated with higher μ, the strategic substitutability of the financial regulatory policies is increased.*

Proof: k_i and k_j are strategic substitutes when $\dfrac{\partial W_i^*(k_i, k_j)}{\partial k_i \partial k_j} < 0$. The cross derivative of the country *i*'s social welfare with respect to k_i and k_j, the domestic and foreign financial regulatory measure, i.e., the capital adequacy requirement ratio, is given as follows:

$$\frac{\partial^2 W_i^*(k_i, k_j)}{\partial k_i \partial k_j} = \alpha_i \frac{\partial^2 \prod_i^*(k_i, k_j)}{\partial k_i \partial k_j} + \beta_i \left(\frac{\partial^2 q_i^*(k_i, k_j)}{\partial k_i \partial k_j} + \gamma \frac{\partial^2 q_j^*(k_i, k_j)}{\partial k_i \partial k_j} \right)$$

$$= \frac{c r_i r_j \gamma \alpha_i E_i \left((2 - c^2) E_i \mu (1 - \theta_i) \theta_i + E_j \left(\mu^2 (1 - \theta_i)(1 - \theta_j) + \theta_i \theta_j \right) \right)}{2 k_i^2 k_j^2} > 0 \ \ if \ c < T$$

$$\text{where} \ \ T = \left(\frac{E_j \left(\mu^2 (1 - \theta_i)(1 - \theta_j) + \theta_i \theta_j \right)}{E_i \mu (1 - \theta_i) \theta_i} + 2 \right)^{1/2}.$$

Therefore, financial regulatory policies of each country, k_i and k_i, are strategic substitutes, $\dfrac{\partial W_i^*(k_i, k_j)}{\partial k_i \partial k_j} < 0$, when $c > T$, while the policies are strategic complements if $c < T$.

Moreover, it is shown straightforwardly that $\dfrac{\partial T}{\partial E_j} > 0$ and $\dfrac{\partial T}{\partial E_i} < 0$. In addition,

when $c > T$, $\dfrac{\partial T}{\partial \mu}\bigg|_{c > T} = -\dfrac{E_j \left(\theta_i \theta_j - \mu^2 (1 - \theta_i)(1 - \theta_j) \right)}{E_i \mu^2 (1 - \theta_i) \theta_i} < 0$. Therefore, when the loan monitoring cost is higher than the critical level, the strategic substitutability of the financial regulatory policies are increased with the higher level of financial integration, μ. $\square$

Proposition 1 demonstrates that when the banking sector is inefficient with the loan monitoring cost of banking sectors being higher than the critical level, it is more likely that the financial regulatory policies are strategic substitutes with higher incentive for each country to free ride the other country's financial regulatory efforts. The intuition behind this result is that when the banking sector is inefficient with the higher monitoring costs, the financial regulation with the higher capital adequacy requirement cannot induce the socially optimal level of loan monitoring efforts, while reducing banking sector's profits significantly. Therefore, each regulator has higher incentives to free ride the other country's regulatory efforts.

In addition, when the domestic banking sector's equity size is higher and the foreign banking sector's equity size is smaller, with the smaller impact of the foreign banking sector on the domestic market, the domestic banking sector has less incentive to coordinate with the foreign banking sector. In addition, given the loan monitoring cost higher than the critical level, the higher capital integration provides higher incentives to free ride the foreign country's regulatory efforts. This result implies that when the banking sector of the partner country has a larger amount of equity with higher monitoring efforts, a country's financial regulator has a higher incentive to coordinate with the country since the gains from the coordination is larger. Contrarily, when a country's equity is relatively larger than the partner's, the incentive for policy coordination gets lower since the gains from the coordination is lower.

Based on Lemma 1 and Proposition 1, it is shown straightforwardly that joint-welfare maximizing financial policy coordination cannot be sustained when both policy makers take short-sighted approaches with a relatively low concern for policy continuity in Corollary 1.

Corollary 1. *International policy coordination for the cooperative regulatory policy might not be sustained when $c > T$ and both policy makers take short-sighted approaches.*

Proof: The capital requirement ratio under a one-shot non-cooperative Nash game

type financial regulation policy decision process should satisfy the following first order condition:

$$\alpha_i \frac{\partial \prod_i^*(k_i,k_j)}{\partial k_i} + \beta_i \frac{\partial\left(q_i^*(k_i,k_j)+\gamma_{ji}q_j^*(k_i,k_j)\right)}{\partial k_i}=0 \qquad (11)$$

The joint welfare maximizing financial regulation policy, $k*$, satisfies the following first order condition:

$$\alpha_i \frac{\partial \prod_i^*(k)}{\partial k} + \beta_i \frac{\partial\left(q_i^*(k)+\gamma_{ji}q_j^*(k)\right)}{\partial k} + \alpha_j \frac{\partial \prod_j^*(k)}{\partial k} + \beta_j \frac{\partial\left(q_j^*(k)+\gamma_{ij}q_i^*(k)\right)}{\partial k}=0 \qquad (12)$$

However, without a credible enforcement mechanism for the optimal cooperative regulation policy under a short-sighted policy approach, country i might have an incentive to deviate from the cooperative strategy, despite homogenous political economic structures as shown in the follows:

$$\left(\alpha_i \frac{\partial \prod_i^*(k_i,k_j)}{\partial k_i} + \beta_i \frac{\partial\left(q_i^*(k_i,k_j)+\gamma_{ji}q_j^*(k_i,k_j)\right)}{\partial k_i}\right)\Bigg|_{k_i=k_j=k^{C^*},\,c>T} < 0 \qquad (13)$$

The above inequality implies that the financial regulator in country i with a short-sighted policy approach has an incentive to deviate from the cooperative financial regulation to a non-cooperative regulatory policy: $W_i(k_i^{N^*},k_j^{C^*}) > W_i(k^{C^*})$.[14] □

The intuition behind Corollary 1 is that the positive cross-border externalities in financial regulation provide incentives for free-riding in financial regulation when a credible enforcement mechanism for the cooperative regulatory policy is not established. Therefore, an introduction of a policy coordination mechanism in financial regulation might allow for a cooperative equilibrium in banking regulation by making the cooperative regulatory policy as a self-enforcing policy option. The asymmetry of the parameter, α_i, which stands for the asymmetry of the political influences of the representative banking sector, represents the asymmetry of political economic structure of financial regulatory system. It is shown that the level of the political economic

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[14] Inequality (13) shows that at the given level of cooperative regulatory policies, the partial derivative of the social welfare with respect to the capital requirement ratio is negative. This result implies that the domestic government can improve the social welfare by reducing the level of capital adequacy requirements from the cooperative level.

asymmetry among the coordinating countries play a major role in the introduction of the effective policy coordination mechanism for financial regulation in Proposition 2.[15]

Corollary 2. *Given strategic substitutability of financial regulatory policies with $c > T$, if countries show relatively low asymmetries in political economic characteristics and higher policy continuity as represented in a higher discount factor, the simple adoption of an international coordination mechanism for financial regulation might enable international policy coordination in financial regulation, even without a credible enforcement mechanism to implement a cooperative strategy.*

Proof: A higher level of policy continuity is reflected by a higher discount factor in the policy coordination game. In addition, the adoption of international policy coordination itself implies that the mode of the game is transformed from a one-shot game to a repeated game. The proposition is proved by demonstrating that it is self-enforcing for a country to choose a cooperative financial regulatory policy, k^C, when the discount factor is higher than a critical level and the political economic asymmetry is lower than a critical level.

When the parameters representing the discount factor and the asymmetry in political economic structures belong to the intervals defined as and $\sigma \in [0, \underline{\sigma})$, where $\sigma = |\alpha_i - \alpha_j|$, the incentive compatibility condition for each policy maker to abide by the cooperative financial regulatory policy coordination, defined as follows, should hold:

$$W_i(k_i^{N*}, k^{C*}) + \frac{\delta W_i(k_i^{N*}, k_j^{N*})}{1 - \delta} \leq \frac{W_i(k^{C*}, k^{C*})}{1 - \delta} \tag{14}$$

where k^N represents non-cooperative regulatory policy that maximizes domestic

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political objective function, and k^C represents the cooperative regulatory policy that maximizes the joint political objective function.

When $\delta \simeq 0$ and $\sigma \simeq \underline{\sigma}$, the incentive compatibility condition cannot hold even in the case of an infinitely repeated game:

$$W_i(k_i^{N*}, k^{C*}) + \frac{\delta W_i(k_i^{N*}, k_j^{N*})}{1-\delta} - \frac{W_i(k^{C*}, k^{C*})}{1-\delta} \Bigg|_{\delta \simeq 0, \sigma \simeq \underline{\sigma}} \simeq W_i(k_i^{N*}, k^{C*}) - W_i(k^{C*}, k^{C*}) > 0 \quad (15)$$

However, when $\delta \simeq 1$ and $\sigma \simeq 0$, the incentive compatibility condition always holds as follows:

$$\frac{W_i(k^{C*}, k^{C*})}{1-\delta} - W_i(k_i^{N*}, k^{C*}) - \frac{\delta W_i(k_i^{N*}, k_j^{N*})}{1-\delta} \Bigg|_{\delta = 1-\varepsilon, \sigma \simeq 0} > \frac{W_i(k^{C*}, k^{C*})}{1-\delta} - W_i(k_i^{N*}, k^{N*}) - \frac{\delta W_i(k_i^{N*}, k_j^{N*})}{1-\delta} \Bigg|_{\delta = 1-\varepsilon, \sigma \simeq 0} > 0$$

Therefore, there are values such as $\overline{\delta}$ and $\underline{\sigma}$ that satisfy the equality condition of the left-hand terms and right-hand terms of inequality (14). Consequently, a self-enforcement condition for the choice of the cooperative financial regulatory policy, (14), holds within the range of $\delta \in (\overline{\delta}, 1]$, $\sigma \in [0, \underline{\sigma})$. $\square$

Proposition 2 implies that when countries show fairly large asymmetry in political economic structures with relatively lower political continuity and low discount factor, the self-enforcement condition for the cooperative financial regulatory policy cannot be sustained without a credible external enforcement mechanism. When a bigger asymmetry of political economic feature of each country is observed, with $\sigma \geq \underline{\sigma}$, it is more likely that each country has a larger incentive to deviate from the cooperative financial regulatory policies as shown in equation (15).

Therefore, if the self-enforcement condition for the cooperative financial regulatory policies cannot be satisfied with a relatively lower discount factor and higher heterogeneity in the political economic structure of coordinating countries, it is required to introduce a mechanism for cooperative financial regulatory policies that is enforced by a third party. The credible enforcement mechanism enforced by a third party should

make the cooperative financial regulatory policy as a dominant strategy as stated in Corollary 3.

Corollary 3. *When the self-enforcement condition for the cooperative financial regulatory policies is not satisfied due to a lower discount factor of the policy makers and a lower political economic homogeneity among coordinating countries, effective financial policy coordination can be sustained only with an introduction of a credible enforcement mechanism by a third party.*

When a discount factor of a policy maker is relatively lower, the policy maker makes a short sighted approach, as in the case of discontinuous policies over different political regimes after the regime changes. As a financial regulator takes a short sighted approach, the regulator has an incentive to choose a non-cooperative policy, i.e., a lower capital requirement ratio. The intuition is that when the discount factor of the policy maker is relatively lower, the policy maker has a larger incentive to collect political donations from the financial sector while paying less attention to the financial stability which might be enhanced with more rigorous regulatory policy, i.e., a higher capital requirement ratio.

In the same context, when $\sigma > \underline{\sigma}$, i.e., when countries show larger heterogeneity in the banking sector's political influences, a country with higher α is more likely to deviate to a non-cooperative regulatory policy. That is, when asymmetry of political influences of banking sectors is higher than the critical level, a financial regulator with a higher α will deviate to a lower capital requirement ratio with the eventual collapse of the policy coordination mechanism of the financial regulation.

Therefore, if $\sigma > \underline{\sigma}$, the introduction of the credible enforcement mechanism enforced by a third party is required for effective financial policy coordination.[16]

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[16] The role of a credible external enforcement mechanism is to make the cooperative financial regulation policy as a dominant strategy for all countries involved with the policy coordination. The typical path to make the cooperative financial regulatory policy as a dominant strategy is to impose large enough penalties against a deviation strategy making the payoffs from the non-cooperative policy lower than the payoffs from the cooperative policy. However, considering the international political reality where the credible mechanism to impose the penalty does exist,

Considering the real world constraint that it is politically complicated to introduce the credible enforcement mechanism over the cross-border financial regulatory policies, Corollary 3 suggests that it is more likely that the cooperative financial policy coordination can work among counties where policy makers have higher discount factors with relatively homogenous political economic structures in financial policy making process.

Finally, with the cross-border externalities considered, it is shown that when financial regulatory policies are strategic substitutes, the more political influence the banking sector commands in each country, it is less likely that the socially optimal financial regulatory policy is adopted. When the financial sector has a higher political influence over the financial regulator, with a higher α, the level of capital adequacy requirement decided by the regulator gets lower, eventually leading to a lower financial stability in each country as shown in Proposition 2.

Proposition 2. *When financial regulatory policies are strategic substitutes with $c > T$, if the representative banking sector commands higher political influences on the financial policy making process, it is more likely that the capital adequacy requirement is lowered, leading to a lower level of financial stability.*

Proof: The impact of the government regulation via capital adequacy requirement on banking sector's profits is shown to be negative as follows:

$$\frac{\partial \prod_i (k_i, k_j)}{\partial k_i} = -r_i \frac{\theta_i E_i}{k_i^2} \left(q_i(k_i, k_j) + \gamma_{ji} q_j(k_i, k_j) - k_i \left(q_i^{'}(k_i, k_j) + \gamma_{ji} q_j^{'}(k_i, k_j) \right) \right) - 2c q_i^{'}(k_i, k_j) < 0 \quad (16)$$

Moreover, given a continuously differentiable policy objective function, $W(k_i, k_j)$, the impact of the banking sector's political influence on the government decision of the capital adequacy requirement is given as follows:

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the self-enforcing condition for the cooperative regulatory policy can be interpreted as the unique condition for the cooperative policy coordination.

$$\frac{\partial k_i^*}{\partial \alpha_i} = -\left(\frac{\partial W(k_i, k_j)}{\partial k_i}\right)^{-1}\left(\frac{\partial W(k_i, k_j)}{\partial \alpha_i}\right) = -\prod_i^*(k_i, k_j)\underbrace{\left(\frac{\partial W(k_i, k_j)}{\partial k_i}\right)^{-1}}_{+}\Bigg|_{k_i = k_i^*} < 0 \qquad (17)$$

Therefore, the higher political influences of the banking sector induce the financial regulator to impose a lower capital adequacy requirement, and eventually lower the financial stability with lower monitoring efforts of the banking sectors due to the lower level of capital adequacy requirement. □

Proposition 2 shows that, in contradiction to the general perception that the banking sector benefits most from the financial stability, the politically influential banking sector has an incentive to add political pressures on the financial regulator to lower the level of capital adequacy requirement at the sacrifice of financial stability. This implies that it is socially desirable to reduce or limit the banking sectors' efforts to increase the political contribution to influence policy makers when financial regulatory policies are strategic substitutes with $c > T$, and therefore provide incentives to free-ride other countries' regulatory efforts.

4. Policy coordination for financial regulation with strategic complementarity of regulatory policies

In contrary to the case of strategic substitutability of financial regulatory policies, when strategic complementarity holds for financial regulatory policies of neighboring countries with cross-border externalities, a country has no incentive to free ride other country's monitoring efforts. Under strategic complementarity of regulatory policies, a country benefits from her own monitoring efforts in a complementary way to the other country's monitoring efforts. However, strategic complementarity provides multiple equilibria under complete information, which might aggravate the economic uncertainty. We examine the condition for unique equilibrium under strategic complementarity of regulatory policies in this section.

Lemma 2. *The strategic complementarity of the financial regulatory policies holds when the loan monitoring cost is lower than the critical level.*

Proof: Financial regulatory policies of neighboring countries are strategic complements when the cross-derivative of welfare with respect to each country's regulatory policies on capital requirement ratio shows a positive sign:

$$\frac{\partial^2 W_i^*(k_i, k_j)}{\partial k_i \partial k_j} = \frac{cr_i r_j \gamma \alpha_i E_i \left((2 - c^2) E_i \mu (1 - \theta_i) \theta_i + E_j \left(\mu^2 (1 - \theta_i)(1 - \theta_j) + \theta_i \theta_j \right) \right)}{2 k_i^2 k_j^2} > 0 \ \ if \ c < T$$

$$where \ \ T = \left(\frac{E_j \left(\mu^2 (1 - \theta_i)(1 - \theta_j) + \theta_i \theta_j \right)}{E_i \mu (1 - \theta_i) \theta_i} + 2 \right)^{1/2} . \tag{18}$$

The conditions for the strategic complementarity are just opposite to the case of strategic substitutability of the financial regulatory policies. That is, as the E_j is relatively larger than E_i, and the loan monitoring cost is lower than the critical level, it is more likely that the financial regulatory policy, i.e., the capital adequacy ratio regulation, has the property of strategic complements. □

When financial regulatory policies are strategic complements, there are multiple equilibria under complete information about the payoffs from each type of regulatory policy if the strategic complementarity is strong enough as follows [17]:

$$-\frac{\partial^2 W_i^*(k_i,k_j)/\partial k_i \partial k_j}{\partial^2 W_i^*(k_i,k_j)/(\partial k_i)^2} > 1. \tag{19}$$

If the strategic complementarity of the financial regulatory policies is strong enough as equation (19), each financial regulator responds to other country's regulatory policies too sensitively in a complementary way that there would be multiple equilibria. Multiple equilibria with strong strategic complementarity include extreme types of equilibria such as an equilibrium with excessive financial regulation, $\bar{k}$, and an equilibrium with insufficient regulation, $\underline{k}$, implying higher financial instability. The financial instability due to the multiple equilibria of financial regulation is aggravated by the higher level of cross-border externalities in financial market as shown in proposition 3.

Proposition 3. *Given the strategic complementarity of financial regulatory policies with low loan monitoring costs and relatively larger foreign banks' equity size, $E_{j \neq i}$, when the financial cross-border externalities, represented by γ and μ, are higher, it is more likely that there are multiple equilibria in international financial policy coordination game over regulation on capital adequacy requirement.*

Proof: There are multiple equilibria in financial market when the absolute value of equation (19) is larger than unity. It is shown that the value of equation (19) is

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[17] The condition for a unique equilibrium in the financial policy coordination game is given as: $\left| -\frac{\partial^2 W_i^*(k_i,k_j)/\partial k_i \partial k_j}{\partial^2 W_i^*(k_i,k_j)/(\partial k_i)^2} \right| < 1$. This condition implies that there can be a unique equilibrium when the strategic complementarity is contained within the following range: $0 < -\frac{\partial^2 W_i^*(k_i,k_j)/\partial k_i \partial k_j}{\partial^2 W_i^*(k_i,k_j)/(\partial k_i)^2} < 1$. In the same spirit, given strategic substitutability of financial regulator policies, the condition for the unique equilibrium is: $-1 < -\frac{\partial^2 W_i^*(k_i,k_j)/\partial k_i \partial k_j}{\partial^2 W_i^*(k_i,k_j)/(\partial k_i)^2} < 0$.

increasing with the higher level of cross-border externalities in the financial markets, γ and μ as follows:

$$-\frac{\partial^2 W_i^*(k_i, k_j)/\partial k_i \partial k_j}{\partial^2 W_i^*(k_i, k_j)/(\partial k_i)^2} = \gamma \mu^2 \alpha_i (1-\theta_i)\theta_i + (1-\theta_i)(1-\theta_j) + \theta_i \theta_j = L \qquad (20)$$

$$\frac{\partial L}{\partial \gamma} = \mu^2 \alpha_i (1-\theta_i)\theta_i > 0, \quad \frac{\partial L}{\partial \mu} = 2\gamma \mu \alpha_i (1-\theta_i)\theta_i > 0. \quad \square$$

This implies that as the financial markets are more integrated with higher financial cross-border externalities, the strategic complementarity of financial regulatory policies is increased with regulators being more sensitive to the other countries' policies. [18]

It has been shown in Proposition 1 that when the banking sector's efficiency is lower than the critical value, financial regulatory policies are strategic substitutes where each country has a strong incentive to deviate to non-cooperative policies. On the other hand, if the monitoring cost of the banking sector is lower than the critical value, the regulatory policies become strategic complement providing no incentive to free ride the other country's regulatory efforts, while the financial stability is reduced due to multiple equilibria under complete information.

When the financial regulatory policies are strategic complements, the equilibrium financial regulatory regime might be either the case with maximum level of regulatory efforts by coordinating countries or the case with a minimum level of regulatory efforts as multiple equilibria. Therefore, even if there is no strong incentive to free ride the other country's regulatory efforts, when there is no explicit regulatory policy coordinating mechanism, the financial regulatory regime might be very unstable with the multiple equilibria of two extreme cases. The case of strategic complementarity of financial regulatory policies provides another rationale for the necessity of the international coordination mechanism for financial regulatory policies to avoid the

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[18] This result is in the same context as the fact that herd behaviors in the financial markets are increased in an integrated financial market with reduced financial transaction costs, and the increased herd behaviors amplifies the financial volatility.

uncertainty in the financial regulatory regime due to multiple equilibria, which is summarized in Corollary 4.

Corollary 4. *When financial regulatory policies are strategic complements with relatively lower monitoring costs of banks, the introduction of international financial policy coordination mechanism is required to reduce the uncertainty in financial regulatory regime due to multiple equilibria of the regulatory regime even if there is no free-riding incentive among regulators.*

When financial regulatory policies are strategic substitutes, the introduction of international policy coordination mechanism among relatively homogeneous countries in political economic structures is required to reduce the incentives for free-riding other countries' regulatory efforts. However, when financial regulatory policies are strategic complements with relatively lower monitoring costs of banks, regulators do not have the incentives to free ride other countries' regulatory efforts. Nonetheless, it is required to introduce international policy coordination mechanism to reduce the uncertainty of the regulatory regime due to multiple equilibria of the regulatory regime.

5. Concluding remarks

This paper determines the equilibria of international policy coordination game in both cases of strategic substitutability and complementarity of financial regulatory policies. Moreover, we examine the conditions for cooperative financial regulatory policy coordination mechanism to be self-enforcing considering the cross-border externalities of multinational banks and the political influences of the banking sectors on the financial regulator. Given strategic substitutability of financial regulatory policies with a relatively higher loan monitoring costs, the higher is the asymmetry of the political influences of banking sectors, the higher are the incentives to free ride the regulatory efforts of other countries, deteriorating the self-enforcing condition for policy coordination condition.

More specifically, we demonstrate that when the level of political economic asymmetry is lower than the critical level and policy-continuity is higher than the critical value, the simple introduction of a policy coordination mechanism itself can make cooperative policy coordination as self-enforcing even without a credible external enforcement mechanism even if financial regulatory policies are strategic substitutes providing incentives for free-riding. However, when the asymmetry in the political economic structure is larger than the critical level, and policy continuity is lower than the critical value, an external enforcement should be adopted to ensure credible policy coordination in carrying out effective financial regulation. This implies that regional coordination of financial regulation and stability is feasible among relatively homogeneous countries with political stability simply by implementing a coordination mechanism. Moreover, although banks benefit from financial stability, we found that the banking sector with a higher political influence prefers a regulatory policy that might lower financial stability with lower capital adequacy requirement.

However, when financial regulatory policies are strategic complements with lower loan monitoring, financial regulators have no incentive to free ride other countries' regulatory efforts while the uncertainty of financial regulatory regime is increased due to multiple equilibria caused by too sensitive complementary responses to

other countries' policies. Therefore, even if the incentives to free ride regulatory efforts of other countries are removed when regulatory policies are strategic complements, it is required to introduce the international regulatory policy coordination mechanism to reduce the uncertainty of regulatory regime.

These findings suggest that the initial efforts to introduce an international policy coordination mechanism in financial regulation should be made among relatively homogeneous country group. In the same context, more efforts are required to arrange homogenous political economic approaches on financial regulatory issues among coordinating countries in the initial stage of coordination. If the difference in the political economic position on certain issues of financial regulation cannot be resolved among the all coordinating member countries in short term, sub-group approaches among relatively homogenous countries would be a second-best approach. In addition, it would be socially desirable to reduce or limit the banking sectors' efforts to increase political contribution or influences on policy makers with the introduction of more transparent decision making mechanism for financial regulation when regulatory policies are strategic substitutes.

The results obtained require a few caveat in interpretation since the model in this paper did not consider the case where banking sectors have various options for investment other than loan-making. In addition, the policy objective function did not consider the welfare of the borrowers, which would be more important issues in welfare analysis. Moreover, studies on the equilibrium refinement issue when there are multiple equilibria in regulatory regime might provide further insights on the mechanism design of the optimal international coordination mechanism for financial regulatory regime. These issues should be tackled in the future studies.

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