

Level Playing Fields in International Financial Regulation

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ABSTRACT

We analyze the desirability of level playing fields in international financial regulation. In general, level playing fields impose the standards of the weakest regulator upon the best-regulated economies. However, they may be desirable when capital is mobile because they counter a *cherry-picking* effect that lowers the size and efficiency of banks in weaker economies. Hence, while a *laissez faire* policy favors the better-regulated economy, level playing fields are good for weaker regulators. We show that multinational banking mitigates the cherry-picking effect, and reduces the damage that a level playing field causes in the better-regulated economy.

AN IMPORTANT THEME IN RECENT DISCUSSIONS of financial regulation has been the desirability of an internationally level playing field. For example, the desire to establish a level playing field in bank capital requirements was one of the driving forces behind the 1988 Basel Accord, and the Basel Committee on Banking Supervision (1999, p. 10) remains committed to the principle of a level playing field. Advocates of the level playing field argue that it improves global welfare by ensuring that institutions in different countries are subject to the same regulations, meaning that internationally active financial institutions will compete on an equal footing, and hence that the more efficient institutions will gain a larger market share. In this paper we examine the costs and benefits of imposing a level playing field. We draw attention to an externality between financial regulators that can be corrected by agreeing on a level playing field, but we argue that such an agreement comes at a cost: it requires participating countries to adopt lowest common denominator regulations, and hence it penalizes countries with better regulators.

The trade-off we identify arises as follows. First, to see the cost of level playing fields, note that in our model, capital requirements are essentially a substitute for high-quality auditing by the regulator. If the regulator has a poor reputation

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for auditing bank license applicants, tighter capital requirements will have to be imposed, which is bad for the economy because it reduces the extent of valuable financial intermediation. We show that adopting an international level playing field in capital requirements is costly because it means that all countries must adopt the standards needed by the weakest regulator. Intuitively, allowing countries flexibility to set their own regulation is always better if there are no externalities between them.

Second, to see the benefit of level playing fields, note that when bank capital is mobile, an externality arises between regulators even when banks do not compete with one another. The externality exists in our model because bank location is endogenous and responds to the quality of regulation. In our model, where there is no deposit insurance, banks make more profits if they are regulated by the regulator with the best reputation. This is because a charter from the best regulator bestows the greatest depositor confidence, which allows banks to obtain deposits at the lowest rates and enjoy the loosest capital requirements. So all banks would prefer to be chartered by the best regulator. But if the number of charters awarded by each regulator is limited, as we assume, the fact that the best regulator has the pick of the crop implies that the pool of applicants left to the other regulators contains fewer skilled bankers and hence being chartered outside the better-regulated economy becomes a worse signal than it would be in the closed-economy case. Consequently, when borders are opened and bank capital is mobile, an adverse *cherry-picking externality* is inflicted by the better regulator on the worse regulator. Note that this is not simply a reallocation of banks of different qualities to different economies: There is a net social loss, as the less competent regulators are screening applicants from a worse pool, so that the average quality of banks in the global economy declines.

As the above discussion indicates, the source of the cherry-picking externality is capital mobility, combined with unequal bank profitability across economies: If either bank capital were not mobile, or expected bank profits were independent across locations, the externality would not arise. It follows that there are two ways for more weakly regulated economies to avoid being cherry-picked. First, they could close their borders to international capital flows to try to prevent skilled bank capital from moving abroad. We will return to this possibility shortly. Second, they could try to insist on international regulation that would make license application equally attractive in every country. This second route corresponds to what we call creating a *level playing field*. Formally, we define a level playing field to be an international agreement requiring that banks in different countries be subject to the same capital requirements, and also that they charge the same deposit rates, so that bank profits are independent of charter location. In order for a level playing field to succeed, regulators must coordinate in adopting the *lowest common denominator* regulations that would be appropriate for the weakest regulator in a closed economy. Only then will banks in the weakly regulated economies be content to remain there.

Thus, the cost of level playing fields is that they limit the social benefits of expert regulation in the better-regulated economies, thus shrinking their banking sectors. The benefit is that the banking sector in the less well-regulated economies will be larger and of better quality. We analyze this trade-off in a

number of different setups. In the base case, we allow bankers to be chartered to operate only in one economy, so that multinational banking is impossible. In this case, regulators face a stark choice: between international coordination upon a level playing field, which will disadvantage the well-regulated economy, and a *laissez faire* policy of no international regulation of the playing field, in which case the cherry-picking effect will adversely affect the less well-regulated economy. From a global welfare-maximizing perspective, it turns out to be better to adopt a level playing field, and hence to experience the lowest common denominator effect, when the regulatory abilities in the economies involved are sufficiently similar because the extent of shrinkage implied by the lowest common denominator effect will be small. By contrast, when regulators' abilities are very different, the cherry-picking externality is the lesser of the two evils and an unregulated playing field dominates. This leads to the intuitive conclusion that "similar" economies should endeavor to adopt common capital regulation and deposit rates; economies that are very different should not attempt to follow them, but should adopt their own regulation.

Note that the cherry-picking externality is a fundamental concern in the sense that it arises in our model even though banks operating in different economies do not compete with one another. This is in contrast to other recent work on international capital regulation, which considers the case in which banks from different countries compete with one another and chauvinistic regulators try to tilt the competitive playing field in favor of their own banks. Dell'Ariccia and Marquez (2005) analyze incentives for international regulatory cooperation in a world in which regulators care only about national welfare, and are to some extent actuated by a concern for shareholders of domestic banks. Acharya (2003) considers a model in which regulators maximize national bank value rather than social welfare *per se* and argues that, when closure policies are heterogeneous, level playing fields can result in a welfare-reducing race to the bottom. By contrast, the banks in our model do not compete, and regulators simply try to maximize welfare by selecting the most able bankers. Moreover, the cherry-picking externality that the better-regulated economy imposes upon the worse-regulated one does not benefit the institutions in the better regulated economy.

In addition to the new insights that our work generates for international banking regulations, we believe that it may cast some light upon recent controversies surrounding the welfare effects of financial liberalization. In particular, as noted above, in the absence of a level playing field, one way for poorly regulated economies to avoid cherry-picking externalities is to restrict international capital flows. Several authors have argued that opening an economy increases welfare when there are insufficient local funds to cover all of the available productive investments, or when international diversification increases investors' risk-bearing capabilities (see, e.g., Obstfeld and Rogoff (1995) and Obstfeld (1998)). The South East Asian crisis of 1997 challenged this consensus (Radelet and Sachs (1998)): Several countries that had opened their economies experienced severe problems as a result of rapid capital withdrawals by foreign investors. Many of the difficulties may be attributable to foreign currency borrowings: Stiglitz (2004) and Sachs (1998) argue that they could have been

avoided by restricting capital flows, or substantially increasing capital requirements for developing country banks. However, the latter recommendation runs against the grain of the Basel Committee (1988) capital adequacy regulations, and its theoretical basis is unclear.

In contrast to the earlier literature on financial liberalization, our work identifies a reputational link between open economies, and it highlights a previously unrecognized *reputational* form of contagion. Consider in the context of our base model a world without international regulatory cooperation and hence with an unregulated playing field. Suppose that in this world the better regulator's reputation is exogenously shocked upwards and hence that the selection of banks in the well-regulated economy is improved. This will allow lower capital requirements, larger banks, and an increased level of economic activity in this economy. However, there will be a knock-on effect in the poorly regulated economies. Strengthening the better regulator's ability to identify able bankers will exacerbate the cherry-picking externality: The pool from which the worse regulators select will be of lower average quality and bank quality will decline by more in the poorly regulated economies than it improves in the well-regulated one. As a result, these economies will be forced to increase the capital requirements for their banks. A regulatory improvement in developed banking markets can thus cause a credit contraction in more weakly regulated banking markets.

The contagion effect runs in the opposite direction when there is international coordination on a level playing field. This case is easier to understand: Because capital adequacy ratios in well-regulated economies are determined by the requirements of the weakest member of the Accord, changes in the regulator's reputation there must be transmitted to the regulations affecting all other members.

Reputational contagion occurs in our model after banking licenses have been allocated. It arises because depositors' assessments of bank quality change and with them, the maximum size of the bank changes. As a result, capital flows into or out of the banking sector in each country, but it does not cross borders. The international contagion that we identify is not therefore *triggered* by capital flows, but occurs because bankers are able to set up shop abroad. After they have done so, neither exchange nor capital controls seem likely to attenuate this effect.

In our model, if weakly regulated economies undergo financial liberalization without international coordination on capital requirements, they must ultimately raise capital requirements for their banks. This result is in accordance with Hellman, Murdock, and Stiglitz (2000), who argue that South East Asian financial fragility in the wake of financial liberalization is attributable to the failure of local regulators to raise capital requirements. However, Hellman et al.'s results are driven by the deleterious effects of bank competition when depositors are insured. There is no deposit insurance in our model and banks do not compete. Our results are driven instead by the mobility of bank capital and the cherry-picking effect.

Our analysis is consonant with recent literature stressing the importance of institutions in emerging markets. If weak institutions are synonymous with

low regulator ability then our model demonstrates that financial liberalization is potentially welfare-decreasing when institutions are weak because it leads to cherry-picking in the local market. The central role of local institutions has also been stressed by Prasad et al. (2003), Stiglitz (2004), Demirgüç-Kunt and Detragiache (1998), and Demirgüç-Kunt and Kane (2002).

After analyzing the base case, we extend our model to allow bankers to apply for licenses in more than one country. We call a bank that is awarded a charter to operate in several countries a *multinational bank*. When different regulators receive and act on independent signals, the multiple certification that multinational banks receive makes them more attractive to depositors. As a result, multinational banks can pay lower deposit rates and operate on a larger scale without violating their monitoring constraint. Unlike in the simple base-case model, this effect can serve to raise aggregate welfare in open economies relative to the closed economy case. An improvement in the quality of regulation in the weakly regulated economy has no effect on the well-regulated economy under a *laissez faire* policy, and is welfare-improving in all economies when a level playing field is adopted.

Introducing multinational banks into our model allows us to take a more nuanced view of the capital flows that create cherry-picking effects. We analyze two cases: one in which borders are opened after bankers have received their first license, so that banks are obliged to open at home before they seek a foreign license, and one in which bankers can make their first license application anywhere. In both cases we show that, when multinational licenses are awarded optimally, multinational bank properties are invariant to the country in which the first of their licenses was awarded. Cherry-picking effects are therefore a concern only for single-country local banks that fail to attract a second license.

In the first case of our analysis, where bankers are forced to make their first license application at home, there is no cherry-picking effect. Hence, in this case, level playing fields are unambiguously welfare-reducing relative to a world without international coordination. In contrast, cherry-picking effects exist in the second case, where bankers can make their first license application anywhere, and level playing fields may therefore be the optimal regulator choice.

Which of our two multinational bank models is more appropriate for policy makers? We argue that the key difference between the two is the time horizon. In the short run, the first of the two models is clearly the more appropriate. Multinational bank license applicants come from a pool of pre-existing bankers, who acquire local licenses before branching out. Hence the short-run impact of level playing fields is likely to be negative. However, future bank start-ups will respond to the incentives in the second of our multinational bank models, where cherry-picking is a concern. The long-term evolution of the banking sector will therefore reflect the effects that we identify in the second of our multinational bank models, so that level playing fields may be optimal in the longer term.

Our multinational bank analysis has two general implications, which are true in both of our models. First, because multinational banks are unaffected

by cherry-picking effects, forcing them to adopt the level playing fields that apply to local banks serves no purpose at all: International banking regulations should be conditioned upon the organizational form of the bank, with multinational banks experiencing a lighter regulatory touch. Second, because they are unaffected by level playing fields, multinational banks reduce the deleterious effect of regulatory coordination upon well-regulated economies. In the second of the cases that we analyze this implies that level playing fields are the optimal regulatory choice for a wider range of parameter constellations than they are in the base case, where there are no multinational banks. In the first case that we analyze, although level playing fields are never the optimal choice, they do less damage than they would without multinational banks. In both cases, multinational banking means that welfare with open borders and level playing fields can be strictly higher than it would be with closed borders, so that financial liberalization can be welfare-enhancing in the presence of multinational banks, whereas it is always welfare-reducing in their absence. The previous paragraph indicates that level playing fields may be optimal in the long run, if not the short run. When multinational banks are treated correctly, the observations in this paragraph suggest level playing fields may be the safest regulatory choice.

The paper is organized as follows. Section I presents a simple model of unregulated banking in which there is adverse selection of and moral hazard by banks. Section II shows how a regulator can increase value in a closed economy by screening license applicants. This section serves to substantiate our observation that capital requirements and regulatory skill are substitutes, and provides a benchmark for our open economy analysis. Section III examines the effect of opening the economy to foreign bankers with both level and unregulated playing fields for capital requirements. We examine the operation of multinational banks in Section IV. Section V discusses the empirical implications of our work, and relates it to the existing empirical literature. Section VI considers a number of extensions to our model. Section VII concludes. The more complex proofs appear in the appendix.

I. The Banking Model

Our model examines the interaction in one or two economies between two types of risk-neutral agents: N depositors and B bankers. In this section, we describe the strategies and payoffs of the agents in a general economy; in later sections we show that the properties of the economy depend upon the quality of the banking regulator, and upon whether the economy is closed or open.

The depositors are endowed with \$1 and with a project that will return R in case it succeeds and zero otherwise. The probability that a project succeeds is p_L . This project will serve as the depositors' outside option to investing in a bank.¹

¹ The fact that the project is risky is immaterial here since all agents are risk-neutral. In other work (Morrison and White (2005)), we endogenize the choice to become a banker.

Each banker is also endowed with \$1 (his *capital*) and with a constant-returns-to-scale project, which will also return R or zero. Bankers' projects succeed with a probability p_L if unmonitored. Some bankers are also endowed with a *monitoring technology*: we will refer to these bankers as *sound*. The monitoring technology increases the probability of project success to $p_H = p_L + \Delta p > p_L$. Monitoring is neither observable nor verifiable and its cost to the banker per dollar invested in his project is $C > 0$.

Because bankers' projects are scaleable, bankers can augment their funds with deposits from other agents and manage them on their behalf. A banker who accepts deposits and manages funds in this fashion is said to be running a *bank*. We assume that the returns from bank investments are verifiable and hence contractible, so that ex post theft is outside the scope of our model.

The relationship between a banker and his depositors is governed by a deposit contract under which the depositor receives a payment of $R - Q$ per dollar invested if the project of the bank in which he invested is successful, and nothing otherwise. A banker who runs a bank of size k therefore receives a payment of $R + (k - 1)Q$ in the event that his project succeeds (equal to R on his own capital and $R - (R - Q) = Q$ left from the investment of each dollar of the depositors' money).

We assume that it is efficient for bankers to monitor their investments if they can:

$$R \Delta p > C.$$

The return on deposits is therefore at least as great as that on self-managed funds. It follows that the social optimum is attained when all agents deposit their funds in banks and sound bankers monitor their investments. The greater the proportion of sound bankers, the greater will be the welfare gain from banking, and the higher will be the incentive of agents to deposit, all other things being equal.

We now examine the incentives that bankers and depositors face. First, sound bankers running a bank of size k must choose to monitor. This will be the case if the returns to a bank from a monitored investment exceed those on an unmonitored investment:

$$(R + (k - 1)Q)p_H - Ck \geq (R + (k - 1)Q)p_L, \text{ or} \\ Q \geq \frac{Ck - R \Delta p}{(k - 1)\Delta p}. \quad (1)$$

Second, the deposit contract must satisfy the bankers' participation constraint. Sound bankers are willing to accept deposits as long as $(R + (k - 1)Q)p_H - Ck \geq R p_H - C$, or

$$Q \geq \frac{C}{p_H}. \quad (2)$$

Depositors' incentives depend upon the probability that a randomly selected bank will be sound, which we refer to as the *pool quality*, which we denote by

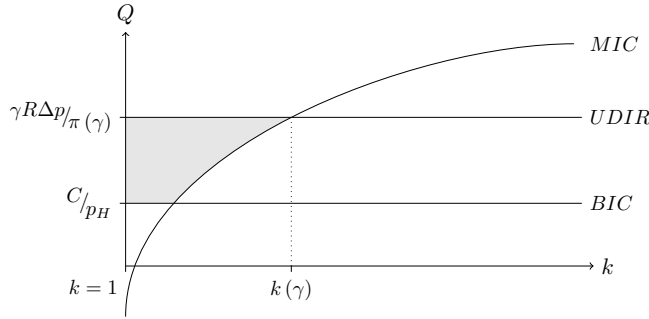


Figure 1. Banking in an economy with pool quality γ . The monitoring IC constraint (1) and the banker's and depositors' respective IR constraints (2) and (4) are labelled *MIC*, *BIC*, and *UDIR*. Banks in the unregulated economy are possible at (k, Q) pairs in the shaded region. The maximum bank size is $k(\gamma)$.

γ . The pool quality γ will in general depend upon both the quality of regulation and whether or not the bankers operate in open economies.

The unconditional probability that a depositor's investment will yield a nonzero return is

$$\pi(\gamma) \equiv p_L + \gamma \Delta p. \quad (3)$$

Because all depositors are ex ante identical and are faced with incentives that do not depend upon the actions of other depositors, without loss of generality we can consider only symmetric equilibria. We further restrict ourselves to pure strategy equilibria.

If depositors are to deposit their money in banks, rather than invest it in their outside option, depositing must satisfy the following individual rationality constraint:

$$(R - Q)\pi(\gamma) \geq R p_L, \text{ or} \\ Q \leq \frac{\gamma R \Delta p}{\pi(\gamma)}. \quad (4)$$

The left-hand side of the first line above is the expected return to depositors from depositing when the probability of a payout is $\pi(\gamma)$: This must exceed the outside option $R p_L$, which they could earn by managing their own projects.

The monitoring incentive compatibility (IC) constraint (1) is plotted in Figure 1 with the banker's and depositors' participation constraints (2) and (4) for the case where the monitoring IC constraint crosses the depositors' individual rationality (IR) constraint. This happens when

$$M(\gamma) \equiv R p_L \Delta p - \pi(\gamma)(R \Delta p - C) > 0. \quad (5)$$

Sound bankers will wish to provide monitoring services only when the fee Q that they receive from depositors is sufficiently high to compensate them for their delegated monitoring activities and also to ensure that monitoring is

incentive-compatible. This is the case above the lines labelled *MIC* and *BIC* in Figure 1. Depositors will elect to deposit only when the deposit rate ($R - Q$) is sufficiently high: This occurs for values of Q below the line labelled *UDIR*. Banking is therefore possible for (k, Q) pairs, which lie within the shaded region on the figure, and the largest possible bank size is $k(\gamma)$. Note that when $M(\gamma) \leq 0$, so that equations (1) and (4) never intersect, the shaded region is unbounded and banks of any size are possible.

The following proposition describes the properties of Figure 1.

PROPOSITION 1: *Suppose that a proportion γ of the bankers in an economy is sound.*

1. *Banking is possible if and only if*

$$\pi(\gamma) \geq \frac{Rp_L p_H}{Rp_H - C}; \quad (6)$$

2. *When condition (6) is satisfied, the largest possible bank size is $\min(k(\gamma), N/B)$ for $M(\gamma) > 0$, where*

$$k(\gamma) \equiv \frac{Rp_L \Delta p}{M(\gamma)}, \quad (7)$$

and it is $\frac{N}{B}$ for $M(\gamma) \leq 0$.

Proof: Banking is possible precisely when the depositor's IR constraint (4) lies above the banker's participation constraint (2); this reduces to equation (6). The largest possible bank occurs when (k, Q) lies at the intersection between equations (1) and (4), and this occurs when $k = k(\gamma)$; if $k(\gamma)$ exceeds N/B then banks have size N/B . Q.E.D.

When equation (6) is satisfied banks can exist, and some deposits will be managed by sound agents. At the productive optimum depositors are indifferent between their own projects and banks, while bankers are strictly better off than they are in autarky.

Throughout the paper, we associate welfare with productive efficiency: That is, we assume that economy 1 welfare-dominates economy 2 precisely when the expected output of agents' investments in economy 1 is higher than in economy 2. Since investments that are not managed by a sound bank are all invested identically, we can define welfare $W(B, \gamma)$ to be equal to the expected volume of funds that is deposited with sound banks:

$$W(B, \gamma) \equiv \gamma B \min\left(k(\gamma), \frac{N}{B}\right). \quad (8)$$

II. Closed Economies

We now describe in greater detail the economies within which the model unfolds. For the remainder of the paper, there will be two economies, "the North" and "the South," each of which has N risk-neutral depositors as in Section I. In

this section the economies are closed, so that no capital flows between them. We start by describing the benchmark case in which there is no banking regulation in either economy, and we then introduce a banking regulator.

A. Unregulated Closed Economies

We assume that each of the economies in our model has a population of β potential bankers and that, absent regulation, each of them will attempt to run a bank. We assume that $\mu < \beta$ of the bankers in each country is sound, and hence that the pool quality in unregulated economies is

$$g \equiv \frac{\mu}{\beta}. \quad (9)$$

It follows from Proposition 1 that banking will be possible in unregulated economies provided

$$\pi(g) \geq \frac{Rp_L p_H}{Rp_H - C}, \quad (10)$$

in which case the size of each bank will be $\min(k(g), N/\beta)$ and the welfare in an unregulated closed economy will be $W(\beta, g)$.

Although unregulated banking is a Pareto improvement upon autarky, it does not follow that assets are allocated in the most productive fashion: Welfare would be increased by denying unsound bankers licenses to accept deposits. When equation (10) is not satisfied, restricting access to licenses will be a necessary precondition for depositing to occur at all. In the next section we show how a regulator can increase both bank size and social welfare by screening banking license applicants.

B. Bank Regulation in Closed Economies

We now introduce to each economy a banking regulator whose aim is to maximize domestic welfare. As we discuss at the end of Section I, this amounts to maximizing the expected volume of funds that is managed by sound banks. We assume that deposit-taking is illegal without a banking license, and that only the regulator can award banking licenses. By allocating licenses appropriately, the regulator can affect the proportion of sound and unsound bankers that depositors will encounter.² As in Section I, we assume that bankers can commit

² In our model, we neglect closure policy and allow regulators to influence banking sector quality only at the ex ante stage by influencing the quality of successful license applicants. In practice, of course, regulators can also influence bank quality by forcing bank exit. We do not believe that the qualitative results of our analysis would be altered by allowing the regulator to close unsound banks at the interim stage with some probability (see Morrison and White (2005)), so we abstract from this possibility in the interests of simplicity. One can also reinterpret the current model as a model of closure policy by supposing that each country currently has N banks with average quality γ operating, and that the regulator's role is to consider which μ banks should have their licenses

to a particular bank size k , and that they extract all of the surplus that their monitoring brings.

The regulator has a screening technology for distinguishing between sound and unsound bankers when awarding licenses. Suppose that the regulator is required to assign m licenses to a population of P bankers of which a proportion s is sound.³ When she applies the technology it will randomize between the following two outcomes:

1. *Random assignment.* In this case the technology will allocate licenses randomly in such a way as to allocate precisely sm licenses to sound bankers and $(1 - s)m$ licenses to unsound bankers.
2. *Correct assignment.* In this case the technology will allocate licenses to $\min(m, sP)$ sound bankers, and if $m > sP$ it will randomly assign the remaining $m - sP$ licenses to unsound bankers.

We refer to the probability that the licenses are correctly assigned to sound bankers as the regulator's *ability*. Regulator ability is a technological parameter; the Northern regulator's ability is a_N and the Southern regulator has ability $a_S < a_N$.^{4,5}

We assume that the regulator allocates precisely μ banking licenses. This simplifying assumption is actually the first-best policy for sufficiently high ability. To see this, note that if the regulator's ability were 1 it would clearly be optimal to allocate μ licenses, since allocating more licenses would serve only to diminish the quality of the banker pool. This would reduce depositors' confidence in the banking sector and so would increase the minimum deposit rate that they would accept; this in turn would lower the maximum bank size

renewed. In principle, we could also model the process of entry and exit by running our economy for several periods and allowing our regulators to consider whether to renew licenses at the beginning of each period, but this would introduce other complications relating to regulatory management of reputation (Morrison and White (2009)).

³ Throughout the paper we consider only equilibria in which $P \geq m$ so that there are sufficient license applicants for all licenses to be awarded. Our off-the-equilibrium path assumption is that in the event that fewer than m applications are received, the regulator holds all the applicants in reserve until more applicants arrive and the total pool size exceeds m .

⁴ For much of the paper, this technology could be alternatively presented in terms of regulator reputation. Suppose that good regulators are able perfectly to distinguish sound from unsound bankers, while bad ones do so with probability $\frac{1}{2}$, and interpret the regulator's ability as the probability that depositors assign to the event that she is good. Then, in a one-shot game with more than m sound bankers, the technology in the text is equivalent to license allocation by a regulator who repeatedly samples the applicant pool with replacement until m licenses have been awarded. We do not adopt this approach for two reasons. First, when a is a reputational parameter rather than a technological one, regulators may in some circumstances attempt to signal their types. Second, the reputational approach causes unnecessary complication when there are fewer than m sound bankers in the economy.

⁵ In our model, we will assume that the regulator always tries to maximize social welfare, but that she does not always have a good technology for doing so. One could imagine a variation of the model where rather than being potentially incompetent, the regulator is corrupt or influenced by political concerns with some probability. If a corrupt regulator allocates licenses to applicant types in proportion to their population in the applicant pool, then the probability of random assignment can simply be reinterpreted as the probability that the regulator is corrupt.

compatible with monitoring. This size effect would reduce welfare. For lower abilities the size effect would still obtain, but its welfare consequences would to some extent be countered by a quality effect: Increasing the number of licenses raises the likelihood that all sound bankers receive a license when the technology randomizes. For sufficiently high a , the size effect outweighs the quality effect and the first-best policy is to allocate μ licenses.⁶

The introduction of the regulator does not affect the banker monitoring incentive compatibility and participation conditions (1) and (2); it does, however, alter the unconditional probability γ that a bank is sound. For Northern and Southern banks the respective probabilities are γ_{CN} and γ_{CS} :

$$\begin{aligned}\gamma_{CN} &\equiv a_N + (1 - a_N)g; \\ \gamma_{CS} &\equiv a_S + (1 - a_S)g.\end{aligned}$$

Let $\bar{a}_C$ be the value of a_N at which $k(\gamma_{CN}) = \mu/N$. Then the following result follows immediately from Proposition 1:

COROLLARY 1: *When economies are closed and the banking regulator in country $i \in \{N, S\}$ has ability a_i , banking is possible in country i if and only if $\pi(\gamma_{Ci}) \geq \frac{R_{PL}P_H}{R_{PH}-C}$. In this case the maximum possible bank size is equal to $k(\gamma_{Ci}) = \frac{R_{PL}\Delta p}{M(\gamma_i)}$ if $a_i \leq \bar{a}_C$, and to $\frac{N}{\mu}$ otherwise.*

It will be convenient to assume that when the regulator is never wrong ($a = 1$), there will be no rationing of deposits and that it will be possible to run banks of maximum size $\frac{N}{\mu}$. A sufficient condition for this to be the case is $M(1) < 0$, or

$$Cp_L < (R\Delta p - C)\Delta p. \quad (11)$$

Note that for $i \in \{N, S\}$, $k(\gamma_{Ci})$ is strictly increasing in a_{Ci} with $k(\gamma_{Ci})|_{a_i=0} = k(g)$: As a consequence of the regulator's screening activities, the maximum bank size $k(\gamma_{Ci})$ in closed regulated economies is strictly greater than the maximum size $k(g)$ without regulation. Since each bank has an endowment of \$1, we can regard $\frac{1}{k}$ as a capital adequacy ratio (enforced in this model by the market rather than the regulator; see Morrison and White (2005) for a detailed discussion of optimal capital requirements). The effect of the regulator's screening activities is to allow banks to operate with slacker capital requirements. Note, however, that the regulator need not necessarily increase social welfare: Although she increases the size of individual banks, she reduces the number of banks to μ . The former effect will outweigh the latter only for sufficiently high a_i (so that the expected number of sound regulated banks is high), or for sufficiently high β (so that the size of unregulated banks is very small). In what follows we will assume that a_N and a_S are sufficiently large to ensure that

⁶ Under the reputational screening model of footnote 4 it is always optimal to allocate μ licenses since to do otherwise would signal low quality and would reduce the size of the banking sector and with it welfare levels.

regulation increases welfare in both the North and the South.⁷ Note that since $\gamma_{CN} > \gamma_{CS}$, $W(\mu, \gamma_{CN}) > W(\mu, \gamma_{CS})$; in other words, depositing and welfare with closed borders are greater in the North than in the South. Northern banks benefit from the more effective screening provided by their regulator because this allows them to offer depositors lower deposit rates, and hence to run larger, more profitable, banks. In the following section, we consider the welfare consequences of cross-border banking in our model.

III. Bank Regulation in Open Economies

In this section, we allow bankers to seek licenses abroad.⁸ For simplicity, we assume that depositors must continue to place their funds with an institution that is locally regulated.⁹ We model the license allocation procedure in two stages. In the first stage, all bankers apply to their first choice regulator for a banking license. If they are indifferent between the two regulators we assume that they apply to their home regulator. Licences are allocated using the technology of Section II.B. We continue to assume that μ licenses are awarded in each country.¹⁰ Then there is a second stage in which bankers who have not been awarded a license by their first choice regulator can apply for a license in their

⁷ When $k(\gamma_i) < \frac{N}{\mu}$ it is easy to show that a necessary and sufficient condition for this to be the case is $\alpha_i > \frac{M(g)}{2(R\Delta p + C)p_L - M(g)}$.

⁸ In our stylized model in which every individual holds one unit of capital, there is no real distinction between mobility of labor (bankers) and mobility of capital (bank equity capital). It is tempting to reinterpret our model as one where it is talented bankers that are mobile, and the important asset that moves with them is their human capital. The intuition would be that talented people may expect to earn higher rents in better regimes, providing an intuitive model of the so-called “brain drain.” We thank the associate editor for drawing our attention to this possible reinterpretation. We leave this as a topic for future research.

⁹ When deposits are rationed in both countries, this assumption is without loss of generality. Relaxing it would introduce additional complications if the Northern regulator had ability $a > \bar{a}_{C_i}(g)$: In this case, movement of depositor funds would improve asset allocation and hence would mitigate in favor of open economies. A complete analysis of the effects of foreign exchange controls is however outside the scope of this paper.

¹⁰ Several comments are in order here. First, we are assuming that although the Northern regulator is stronger, the Southern regulator does not delegate the screening of applicants in the South to the Northern regulator. The Southern regulator continues to apply her own regulatory technology. We make this assumption for two reasons. First, it seems realistic that no national regulator will be permitted by her government to delegate to a foreign institution all responsibility for bank licensing (although in some economies such as New Zealand this has de facto occurred). Second, we wish to model the effects of regulator competition, and the most direct way to do this is to continue to assume, as in our benchmark closed economy, that there are μ banks in each country. In fact, when there is deposit rationing in the North, the Northern regulator might wish to allocate more than μ licenses once the economy is opened and the number of sound applicants to the North increases. Intuitively, this would only worsen the negative cherry-picking externality on the South by further reducing the quality of the pool that will subsequently apply there. This will become clear when we discuss cherry-picking externalities below. We do not pursue this extension because the joint analysis of the optimal number of licenses and the optimal choice of capital requirements has proved intractable.

second choice country. In this section, we allow bankers to hold only one license; we relax this assumption in Section IV, where we analyze multinational banks.

We compare two possible regulatory environments: first, an *unregulated playing field*, in which there is no international cooperation on regulation and each country's regulator sets domestic regulations to maximize domestic welfare, and second, a *level playing field* approach, in which international conformity of financial regulations is enforced by international agreement.

A. Unregulated Playing Field

With an unregulated playing field the higher ability Northern regulator is able to run larger banks than the Southern regulator. Moreover, since Northern banks have a higher probability of success, depositors accept lower deposit rates and the Northern bankers therefore earn higher per-depositor profits than the Southern bankers. It follows that every banker applies in the first instance for a Northern banking license.¹¹ The Northern regulator therefore selects bankers from a pool of size $2B$, of whom 2μ are sound; in other words, the proportion of sound license applicants in the North is $g_N \equiv \frac{2\mu}{2B} = g$. Hence, the unconditional probability that a Northern bank will be sound is given by $a_N + (1 - a_N)g = \gamma_{CN}$. It follows from Corollary 1 that the size of a Northern bank with open economies and unregulated playing fields is $k(\gamma_{CN})$ for $a_N \leq \bar{a}_C$, and N/μ otherwise.

If the Northern regulator allocates licenses randomly then the Southern regulator selects from a pool whose expected proportion of sound bankers is g ; if the Northern regulator allocates correctly then the Southern regulator's pool of $2\beta - \mu$ license applicants contains precisely μ sound applicants. The expected proportion of sound license applicants in the South is therefore

$$g_S \equiv a_N \frac{\mu}{2B - \mu} + (1 - a_N) \frac{\mu}{B} = g - a_N \frac{g(1 - g)}{2 - g}. \quad (12)$$

The unconditional probability that a Southern bank will be sound is therefore

$$\gamma_{US} \equiv a_S + (1 - a_S)g_S = a_S + (1 - a_S) \frac{g}{2 - g} (1 + (1 - g)(1 - a_N)). \quad (13)$$

Let $\bar{a}_{US}$ be the value of a_S at which $k(\gamma_{US}) = \mu/N$. Note that because $\gamma_{US} < \gamma_{CS}$, $\bar{a}_{US} > \bar{a}_C$. Then, similarly to Corollary 1, the size of Southern banks in open economies with an unregulated playing field is $k(\gamma_{US})$ if $a_S \leq \bar{a}_{US}$, and is N/μ otherwise. Hence, with unregulated playing fields, opening the Northern and Southern economies has no effect on the size of Northern banks. In contrast, because $\gamma_{US} < \gamma_{CS}$ and $\bar{a}_{US} > \bar{a}_C$, opening the economies causes Southern banks to shrink.

¹¹ For some parameter values, there may be another equilibrium in which depositors anticipate that all bankers apply first to the South. However, numerical calculations indicate that, when it exists, this equilibrium is always Pareto-dominated by the equilibrium in which bankers apply firstly to the North. In the case in which welfare would be higher if bankers could be persuaded to apply first in the South, this is not equilibrium behavior because profits are higher in the North.

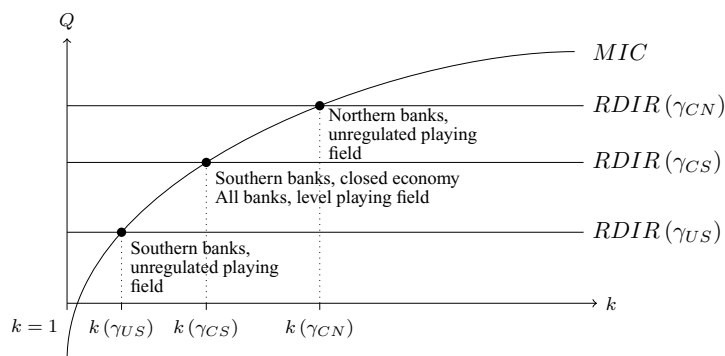


Figure 2. Bank size and deposit rates in open economies. The banker's monitoring incentive compatibility constraint (1) is labelled *MIC*; the depositor participation constraint (4) is labelled *RDIR*, and is indexed by pool quality γ .

Figure 2 illustrates the position of Northern and Southern banks on the monitoring incentive compatibility constraint (1) in (k, Q) space, in the case of an unregulated playing field. Since the applicant pool from which the Northern regulator selects bankers has a proportion g of sound applicants in open and closed economies, bank size in both cases will be $k(\gamma_{CN})$. The proportion of sound applicants in the Southern regulator's pool is g in closed economies and g_S in open economies with no international restrictions on capital requirements. The corresponding bank sizes are therefore $k(\gamma_{US})$ and $k(\gamma_{CS})$.

Recall that welfare in each economy is defined to be equal to the expected volume of funds that is deposited with sound banks. It is clear from Figure 2 that the welfare of the Northern economy is unaffected by international capital flows. This follows because bankers prefer to operate in the North and hence apply there first. They therefore open a Southern bank only if they are turned away by the Northern regulator. Opening the Southern economy lowers the quality of the license applicant pool: $g_S < g$. As a result the expected quality of Southern banks is reduced, and depositors in the South demand a higher deposit rate. Monitoring with the higher deposit rate is incentive compatible only if the Southern bank size is reduced: $k(\gamma_{US}) < k(\gamma_{CS})$. This lowers production levels and hence welfare in the South.

Note that we have assumed that the productivity of banks' investment projects per se is the same in the North as in the South, so the only reason why bankers prefer to operate in the North is that in this economy the strength of the regulator's reputation is such that they can extract more rent from depositors while the latter are still willing to deposit. (This in turn allows bankers in the North to run larger banks.) The South would be better off imposing capital controls to prevent the flight of bank capital to the North; moreover, imposing such controls would not harm the North.

The welfare reduction that the South experiences from opening its economy arises in our model because the Northern regulator cherry-picks the best of the Southern bankers. Clearly, increases in the Northern regulator's ability will

increase the impact of this effect. Our model therefore identifies a form of “reputational contagion”: A positive shock to the Northern regulator’s reputation will shrink Southern bank size. Conversely, improvements in the quality of the Southern regulator will not transmit shocks to the Northern economy, so poorly regulated economies are more vulnerable to such shocks.

We summarize this discussion in the following proposition:

PROPOSITION 2: *In an open economy with an unregulated regulatory playing field:*

1. *The welfare of the Northern economy is the same in the open and the closed economies, while the welfare of the Southern economy is lower in the open than the closed economy. Hence, allowing international capital flows reduces welfare.*
2. *Southern bank size is a decreasing function of Northern regulator quality; Northern bank size is unaffected by Southern bank quality.*

Proof: The first part of the result follows from examination of Figure 2. For a formal demonstration of the second part, note that $\frac{\partial k(\gamma_{US})}{\partial a_N} = -\frac{g(1-g)(1-a_S)}{2-g}$
 $\frac{Rp_L \Delta p^2 (R \Delta p - C)}{M^2(\gamma_{US})} < 0$, while $k(\gamma_{CN})$ is not affected by a^S . Q.E.D.

The reputational contagion identified in Proposition 2 operates through two channels. First, an increase in a_N will have a *quality effect*. The expected proportion of sound bankers in the North will increase. As a result, the proportion of sound bankers in the pool available to the Southern banker will drop. The Northern banker’s ability to cherry-pick from the available pool of bankers will therefore cause a worsening of the expected quality of Southern bankers. Second, the increase in average banker quality in the North will reduce the level of capital required to make depositing incentive compatible and Northern banks will therefore become larger: In other words, there will be a *size effect*. Since confidence in Southern banks will be reduced by the quality effect, the size effect will have the opposite sign in the South.

Without international capital adequacy regulation, we would expect increases in Northern economy reputation to increase inequality between the North and the South. The effect of reputational contagion is to exacerbate this effect: The increase in Northern economy welfare is accompanied by a *reduction* in Southern economy welfare. The aggregate international consequence of improved Northern regulator reputation is therefore not immediately clear, since the welfare changes in the North and South have opposite signs.

With unregulated playing fields and open economies, Northern welfare is equal to $\gamma_{CN}\mu k(\gamma_{CN})$ if $a_N \leq \bar{a}_C$, and to $\gamma_{CN}N$ otherwise, and Southern welfare is equal to $\gamma_{US}\mu k(\gamma_{US})$ if $a_S \leq \bar{a}_{US}$, and to $\gamma_{US}N$ otherwise. The space partition implied by these expressions is illustrated in Figure 3. Admissible (a_N, a_S) values lie below the leading diagonal in the figure. In the lower left region $a_S < a_N < \bar{a}_C < \bar{a}_{US}$ so that neither bank’s maximum size constraint binds; in the middle region $a_N > \bar{a}_C$ and $a_S < \bar{a}_{US}$ so that only the Northern bank’s

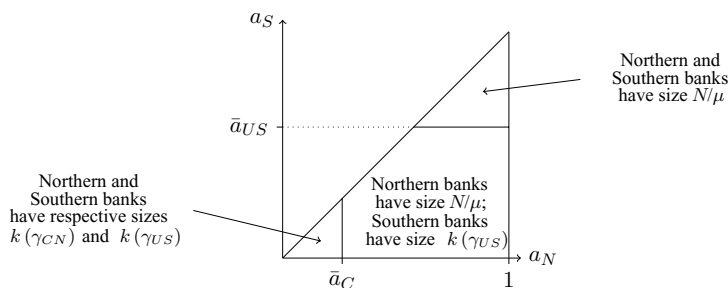


Figure 3. Bank sizes in open economies with an unregulated playing field.

size constraint binds; and in the top region $\bar{a}_C < \bar{a}_{US} < a_S < a_N$ so that both constraints bind.

Under our welfare definition, international welfare is the unweighted sum of national welfares: In other words, it is equal to the total productivity of the international economy. Proposition 3 relates the partition of Figure 3 to the welfare implications of an increase in a^N :

PROPOSITION 3: *In an open economy with an unregulated playing field for capital requirements:*

1. When $a^N < \bar{a}_C$, international welfare is increasing in a^N .
2. When $a^N > \bar{a}_C$ and $a^S < \bar{a}_{US}$, international welfare is increasing in a^N if and only if

$$k^2(\gamma_{US}) < \frac{N}{\mu} \frac{R\Delta p}{C} \frac{2-g}{g(1-a_S)}.$$

3. When $a^S > \bar{a}_{US}$, international welfare is increasing in a^N .

To understand this result, recall that a change in a_N has a size effect and a quality effect. Since the Northern bank is larger than the Southern bank, the welfare consequences of the quality effect will apply on a larger scale in the North than in the South and its aggregate welfare consequence will therefore be positive. The size effect arises because a change in the rate $R - Q$ required to induce depositing changes the intersection point of the depositors' IR constraint (4) with the bank's monitoring IC constraint (1). Since the monitoring IC constraint is concave, a given movement in the depositors' IR constraint will have a greater effect upon the size of the larger Northern bank than the smaller Southern one, so that the aggregate welfare consequence of the size effect will be positive.

Now consider the three regions identified in Figure 3. Part 1 of the proposition refers to the bottom left region in which neither size constraint binds: The size and the quality effect therefore apply in both the North and the South. Since each has a positive aggregate effect upon welfare, increases in a^N must increase total welfare. Part 3 of the proposition refers to the top right region in

the figure, where both size constraints bind and so only the quality effect applies in each region. Once again, welfare is increasing in α^N because the aggregate quality effect is positive. Part 2 of the proposition refers to the middle region, within which the Northern size constraint binds but the Southern one does not. The size effect in this region therefore applies only in the South and hence is welfare-reducing. This effect dominates when the size $k(\gamma_{US})$ of the Southern banks is sufficiently large, as in the proposition.

From an efficiency point of view the phenomena identified in this section are the opposite of what is desirable. In open economies with an unregulated international playing field for capital regulation, bankers would prefer to obtain a license from the more competent regulator, as this would provide them with a better signal and allow them to run a more profitable bank. The more talented regulator therefore gets the pick of the crop, whereas it may be preferable to allow the Southern regulator to cherry pick and then to let the Northern regulator sort the wheat out from the remaining chaff, since the Northern regulator is better equipped to do this.¹² This leads to the idea that it might be efficient from the point of view of total (international) social welfare to enforce a level playing field, so that the Southern regulator picks from a pool that is no worse than that enjoyed by the Northern regulator. We now turn to the analysis of this policy.

B. Level Playing Field

Under the level playing field approach, regulators agree upon international regulations that make banking in the North and the South equally attractive. In this case bankers apply for licenses only in their home jurisdiction and the cherry-picking effects underlying Proposition 2 do not arise.

A level playing field must render banking equally attractive in the North and in the South. This involves two policies. First, both banks must have the same size: In other words, there must be *common capital adequacy requirements*. It is clear from Figure 2 that this is most efficiently accomplished by setting the size of both banks equal to $k(\gamma_{CS})$: This is equal to the closed economy bank size in the South, but is less than $k(\gamma_{CN})$, the closed economy Northern bank size.

Common capital requirements on their own will not achieve a level playing field, however. To see this, note that absent any further regulation, banks will pay the deposit rate $R - Q$ at which the depositors' IR constraint (4) binds: That is, they will set Q equal to $\gamma_{CN}R\Delta p/\pi(\gamma_{CN})$ in the North and equal to

¹² It might seem that our result relies on the fact that the screening technology employed by our regulators is an ex ante one, and that because in reality regulators also perform ex post auditing, it is in practice implausible that *all* banks, including unsound ones, would prefer to be regulated by the better regulator as they do in our model. A moment's reflection, however, reveals that allowing for the Northern regulator to be better at ex post as well as ex ante auditing would only *strengthen* our results by further improving the pool of applicants to the Northern regulator and worsening that available to the Southern regulator as unsound banks are deterred from applying in the North. It might even be desirable to prevent the Northern regulator from extensive ex post audits on the grounds that this would simply force marginal banks to relocate in economies where they would be audited by a less competent regulator. We leave this as a topic for future research.

$\gamma_{US}R\Delta p/\pi(\gamma_{US})$ in the South. Since $\gamma_{CN}R\Delta p/\pi(\gamma_{CN}) > \gamma_{US}R\Delta p/\pi(\gamma_{US})$, banking without deposit rate regulation would be more attractive in the North than in the South. The North would therefore continue to attract *all* of the stage-one license applicants. In short, agreeing to a common capital requirement without implementing a deposit rate floor in the North would reduce Northern welfare without resolving the problems identified in Section III.A. A level playing field therefore requires both *common capital requirements* and *deposit rate floors*.

Under a level playing field, therefore, Northern banks have the same size and also the same deposit rates as Southern banks. In turn, this regime does not affect the welfare of the Southern economy, but it clearly reduces the welfare of the Northern economy.

Moreover, since the size of the Northern economy's banking sector is determined under a level playing field by the quality of the Southern economy's regulator, changes in the Southern regulator's ability are reflected in the North. Reputational contagion therefore arises with level playing fields, but is less complex than with unregulated playing fields. It occurs simply because all banks are constrained to the size of the weakest closed economy bank. The welfare effects of changes to the Southern regulator's ability therefore have the same sign in the North and the South. Hence, international welfare with level playing fields is increasing in a^S .

We summarize the results of this section in the following proposition.

PROPOSITION 4: *In open economies with a level international regulatory playing field:*

1. *The welfare of the Southern economy is the same as in the closed economy, while the welfare of the Northern economy is lower than in the closed economy. Allowing capital flows therefore reduces welfare.*
2. *Northern bank size is increasing in Southern regulator quality, and Southern bank size is unaffected by Northern regulator quality.*
3. *International welfare is increasing in a^S .*

We now examine the choice of international capital regulation regime.

C. Optimal International Capital Regulation

In this section, we determine the circumstances under which a level playing field is preferred to an unregulated one. Recall from the discussion in Sections III.A and III.B that an international level playing field generates a lowest common denominator effect that causes the Northern economy's welfare to be reduced to that of the South. In contrast, when playing fields are unregulated the Northern regulator inflicts a cherry-picking externality upon the South, whose welfare is thereby reduced. The former effect is more important when the Northern regulator is significantly better than the Southern one, so that the loss caused by standardization is high. It is therefore intuitive that the level playing field will be preferred when $a_N - a_S$ is sufficiently low. Proposition 5, which we prove in the Appendix, confirms that this is the case.

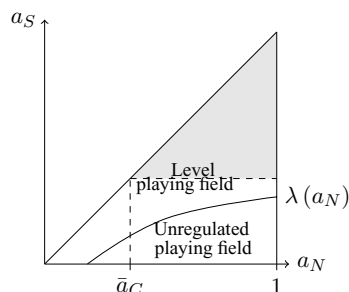


Figure 4. Optimal regulatory regimes for open economies without multinational banks.

PROPOSITION 5: *There exists a function $\lambda(a) < \min(a, \bar{a}_C)$ (possibly negative) with $\lambda'(a) \geq 0$ such that for every $a_N \in [0, 1]$, a level playing field for capital requirements is preferred to an unregulated playing field precisely when $a_S > \lambda(a_N)$.*

This result is illustrated in Figure 4. Recall from Figure 3 that when $a_N \geq \bar{a}_C$, Northern banks have size N/μ irrespective of the regulatory regime, and hence do not gain when there is a shift from level to unregulated playing fields. Hence, the optimal regulatory choice in the shaded region is level playing fields: This is the reason that $\lambda(a) < \bar{a}_C$. Similarly, when $a_N = a_S$, there is nothing to be gained by prescreening license applicants in the North, so that playing fields are optimally level and $\lambda(a) < a$.

Proposition 5 is illustrated in Figure 5, which shows for given parameter values the welfare gains from unregulated as opposed to level playing fields for the North and the South, respectively, and the aggregate effect upon the international economy. Note that the welfare difference in the South is always negative: the size and quality effects of giving the Northern bank first choice from the pool of bankers are both welfare-reducing in the South. Conversely, the welfare difference in the North is always positive, due to the lowest common denominator effect with level playing fields. The dominance of the lowest common denominator effect for high $a_N - a_S$ and of the cherry-picking effect for small $a_N - a_S$ is clear from the figure's final table.

IV. Multinational Banks

We have concentrated so far upon the choice between level and unregulated playing fields when all banks are locally regulated. In this section, we extend our work to multinational banks. We suppose as above that would-be bankers can apply to the two regulators, but we now allow an applicant to accept licenses from more than one regulator. It is natural to call a bank with a license to operate in more than one country a *multinational bank*, and a bank that operates in only one country a local or stand-alone bank.

Intuitively, acceptance by two regulators is a better signal of quality than acceptance by only one, and multinational banks are therefore more likely to be sound than banks that operate in only one country. At a given deposit rate

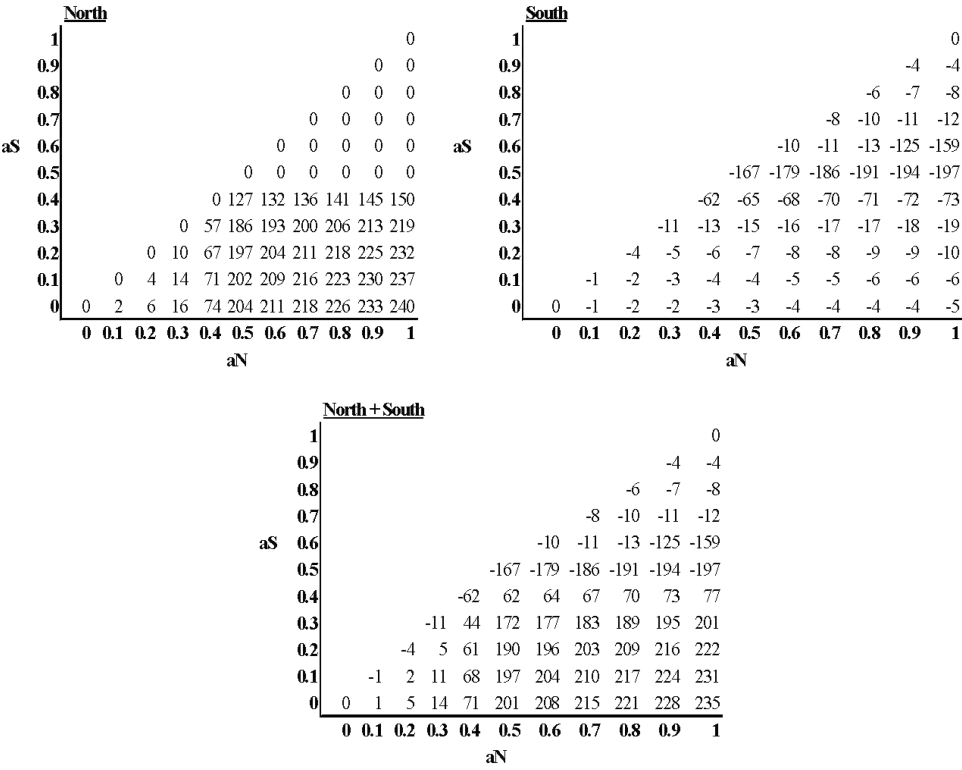


Figure 5. Welfare gain from unregulated as opposed to level playing fields in the North, the South, and internationally. Level playing fields are preferred in the respective regions when the number in the grid is negative. Figures are presented for $R = 2$, $p_L = 0.2$, $\Delta p = 0.4$, $C = 0.5$, $\mu = 12$, $\beta = 50$, and $N = 3,000$.

multinational banks can therefore operate with looser capital requirements than their nationally based rivals, and the public would still be willing to deposit in them. Conversely, if multinational and local banks had the same capital requirements, the multinational banks would be able to offer lower deposit rates while still attracting savers.

It follows from this argument that if regulation does allow multinational banks to exploit their reputational advantage by accepting more deposits or offering lower deposit rates, all license applicants would prefer to be multinationals. The fact that a bank is only local then becomes a negative signal: Multinational banks exert a negative externality upon locally regulated banks, which shrink accordingly. This result is consistent with the empirical work of Claessens, Demirgüç-Kunt, and Huizinga (2001), which suggests that the entry of foreign banks squeezes domestic competition (see also Demirgüç-Kunt and Huizinga (1999), who show that foreign banks earn higher margins than domestic banks in developing countries). We will comment further on the empirical relevance of our results in Section V.

In this section, we examine two different license allocation procedures: one in which borders are opened after licenses have been assigned to local banks, at which stage they can apply for a foreign license, and one in which borders are open initially and banks can choose where to make their initial license applications; in this second case all banks will apply first in the North and then in the South.

The first of these games accurately reflects the way in which international banking networks are formed. When local bankers apply for local banking licenses before attempting to expand overseas there is no cherry-picking effect. In this case foreign charters are valuable because they supply additional certification for the local bank and hence allow it to operate with looser capital requirements. In this case, opening borders to international capital flows is unambiguously welfare-increasing.

The second of these games is not observed in practice. Nevertheless, we believe that it may represent a more long-term picture of an equilibrium where banks can enter and exit. After borders are opened, any new license applicants will in the first instance elect as in our analysis of Section III.A to apply for Northern regulator certification. Over time, therefore, one might expect some cherry-picking externalities to manifest themselves in the Southern economy. We demonstrate that, as before, financial liberalization harms the Southern economy with unregulated playing fields.¹³ However, in contrast to the single-license case, financial liberalization strictly increases Southern welfare when it is combined with a level playing field. This is because of the extra certification that attaches in this case to Southern multinational banks.

A. Borders Opened after Local License Allocation

In this section, we assume that bankers apply for local licenses in closed economies as in Section II.B, after which the economies are opened and successful bankers can if they wish apply for foreign licenses. In addition, we assume that applicants who were unsuccessful in their home economies cannot apply for foreign licenses (we will relax this assumption in the next section). Thus, banks must apply first to their local regulator and, if successful, may then choose to apply for another license abroad. When a multinational bank's *first* license was in the North (respectively, the South), we say that it is *based in the North* (respectively, the South). Since investment opportunities are the same in the North and the South (banks can obtain an expected $Rp_H - C$ if they monitor and Rp_L if they do not, with all projects perfectly correlated), we can allow multinationals to make investments both at home and abroad without loss

¹³ Interestingly, in the World Bank survey of banking regulators (Barth, Caprio, and Levine (2001)), the Fijian regulator noted that the main reason for its rejection of one particular foreign license application was that "The applicant did not own a bank in their own country"—perhaps they were wary of the adverse selection issue that we highlight in this paper! We will examine this survey in more detail in Section V below.

of generality.¹⁴ Similarly, as long as deposits are rationed in both countries, we can allow multinational banks to accept deposits in both or either economy.¹⁵ As in Section II.B, we assume that each regulator will allocate μ local licenses. We start this section by determining the optimal number of multinational banks.

Note that in equilibrium, every banker would prefer to have two charters, as this would send a better signal to depositors and thus would reduce rates, which would lower capital requirements. It follows that every bank will apply for two charters: Local banks have therefore made an unsuccessful license application with the foreign regulator.

Let m denote the number of multinational banks operating in country $l \in \{N, S\}$, and denote the other country by $f \in \{S, N\}$. Consider an arbitrary multinational bank operating in country l . With probability a_l country l 's regulator allocated licenses correctly and the MNB is sound; with probability $(1 - a_l)(1 - a_f)$ both regulators allocated licenses randomly, in which case the probability that the MNB is sound is the proportion g of sound bankers in the economy; finally, with probability $(1 - a_l)a_f$ the foreign regulator allocates licenses correctly and the local regulator randomizes. In this last case there are $g\mu$ sound agents in the pool from which the foreign regulator selects MNBs and the probability M that the MNB is sound is therefore one if $m \leq g\mu$, and $\frac{m}{g\mu}$ otherwise. The unconditional probability that the multinational bank is sound is therefore

$$a_l + (1 - a_l)(a_f M + (1 - a_f)g) = \gamma_M - a_f(1 - a_l) \max\left(1 - g \frac{\mu}{m}, 0\right), \quad (14)$$

where

$$\gamma_M \equiv g + (1 - g)(a_N + a_S - a_N a_S).$$

¹⁴ Obviously, if projects in the North are imperfectly correlated with projects in the South, then the opportunity for diversification opens up another possible motivation for becoming a multinational. Similarly, allowing for differing investment opportunities in the two countries would make it attractive for banks to move to the country with the more profitable investment opportunities. We abstract from these possibilities here in order to focus more clearly on the pure certification benefits of multinational banking.

¹⁵ The multinational banks themselves will be indifferent about where they raise their deposits, and since, under an unregulated playing field, depositors will be held to their individual rationality constraint, in equilibrium they are also indifferent about whether they deposit with a local or a foreign bank. This will also be true under an optimal level playing field since, as we will see below (Corollary 2) Northern and Southern MNBs will have the same quality in that case. But since banking is a profitable activity, the extent to which multinational banks collect deposits abroad will matter for our calculation of welfare in the North and in the South when deposits are not rationed. The reason is that if deposits are not rationed, the expansion of multinational banks abroad will shrink the deposit base for local banks, hurting local welfare. The optimal response of the local regulator is to regulate the capital adequacy of foreign banks so that this does not occur. If we assume that local regulators indeed follow this policy in this case, then without loss of the generality we can allow multinationals to accept deposits at home or abroad, subject to this restriction. Alternatively, our welfare calculations below are consistent with the assumption that multinationals, though licensed to accept deposits in both countries, in fact raise all of their deposits at home.

Similarly, the unconditional probability that an arbitrary local bank in country l is sound is

$$a_l + (1 - a_l)(a_f L + (1 - a_f)g),$$

where L is the probability that the bank is sound if licenses are awarded randomly by country l 's regulator and correctly by country f 's regulator. In this case every sound banker in country l will be awarded an MNB license if $m \leq g\mu$, and hence L will be zero; if $m > g\mu$, then L will be equal to $\frac{g\mu - m}{\mu - m}$. Straightforward manipulation then yields the following unconditional probability that a local bank operating in country l is sound:

$$\gamma_{Ll} + a_f(1 - a_l) \max\left(\frac{g\mu - m}{\mu - m}, 0\right),$$

where for $l \in \{N, S\}$,

$$\gamma_{Ll} \equiv a_l + g(1 - a_N)(1 - a_S).$$

The regulator selects the number m of multinational banks to maximize expression (15), which is the sum of the welfare that country l derives from multinational and local banks:

$$\begin{aligned} &W\left(m, \gamma_M - a_f(1 - a_l) \max\left(1 - g\frac{\mu}{m}, 0\right)\right) \\ &+ W\left(\mu - m, \gamma_{Ll} + a_f(1 - a_l) \max\left(\frac{g\mu - m}{\mu - m}, 0\right)\right). \end{aligned} \quad (15)$$

PROPOSITION 6: *Expression (15) is increasing in m for $m \leq g\mu$, and decreasing for $m > g\mu$. Hence welfare is maximized when $m = g\mu$.*

The simplest way to understand Proposition 6 is as follows. When a foreign regulator chooses to allocate multinational licenses among domestic banks, the set of domestic banks accepting deposits in the economy has not changed, and so the overall quality of the banking system has not changed. However, the additional signal provided by the foreign regulator helps depositors reallocate their capital among domestic banks from those with lower expected quality to those with higher expected quality. Thus, multinational banks will grow and local banks will shrink, and in this way, the overall size-weighted quality of the banking system improves. Since overall quality improves, intuitively, the size of the banking sector improves too, raising overall welfare even though local banks will be made worse off.

To see why the turning point is at $m = g\mu$, note that the extra certification provided by the foreign regulator is useful only in the case in which the local regulator uses random allocation and the foreign regulator uses correct allocation. In that case, the number of sound multinational bank applicants will be precisely $g\mu$ and the foreign regulator will certify as many of these as it is able to. Hence, issuing up to $m = g\mu$ licenses improves the allocation of depositor

funds. Issuing additional licenses will in the relevant case (random home allocation and correct foreign allocation) result in some unsound multinational licenses. This will reduce the effectiveness of the multinational bank sector in allocating depositor funds.

We can think of the number m of multinational banks that country f admits as a measure of the ease with which banks from country l can enter country f . Proposition 6 establishes that the socially optimal value for the ease of entry m is $g\mu$. Moreover, from equation (14), if m is below $g\mu$, the probability that a multinational bank is sound is γ_M , irrespective of its country of origin. However, for $m > g\mu$, the difference between the probability that Northern and Southern multinational banks are sound is $(a_N - a_S)\frac{m}{g\mu} > 0$. Hence, we can state the following corollary to Proposition 6:

COROLLARY 2: When it is no more than optimally easy for banks to expand abroad, the quality of Northern and Southern multinationals is the same; when foreign expansion is more than optimally easy, Northern multinational banks are of higher average quality than Southern multinationals.

Note that when $m = 0$, Proposition 6 collapses to the closed economy case. It therefore has the following additional corollary:

COROLLARY 3: Welfare in both the North and the South is strictly increased by financial liberalization that allows existing local banks to apply for foreign licenses.

In the absence of the cherry-picking effects of Section III, financial liberalization does not impose a negative externality upon the Southern economy. Hence, while leveling the international regulatory playing field would still damage the Northern economy, it is not necessary to protect the Southern one:

COROLLARY 4: Level playing fields are unambiguously welfare-reducing in open economies formed by liberalization that allows existing local banks to apply for foreign licenses.

B. Borders Opened before Local License Allocation

In this section, we use an extension of the model of Section III to model the process of multinational bank license allocation. This reintroduces the cherry-picking externality that was absent in the previous section. In the first stage of the license allocation game bankers start to operate in an open economy, and may apply to any country for their first banking license. If bankers are indifferent between licenses in the North and the South then they apply to their local regulator for a license. In the second stage of the game, with probability $1 - e$, for e small, bankers with licenses may apply for a second license, and unsuccessful applicants may apply to the other country for a banking license. Bankers with two licenses operate as multinational banks, while bankers with only one operate as local bankers. We again assume that multinational banks collect deposits at home.

When the number m of multinational banks in an economy is set equal to its optimal level $g\mu$, we know from Section IV.A that the pool quality for multinational banks will be γ_M , irrespective of whether they are domiciled in the North or the South, and hence that their size and deposit rates will be independent of their home country. However, a bank that is accepted in the North and rejected in the South will be more attractive to depositors, and hence more profitable, than one that is accepted in the South and rejected in the North. As a result, when playing fields are unregulated bankers will prefer to apply first for a Northern license, and then to the South for a multinational license if they were successful in the North, or for a local license if they were unsuccessful in the North. It follows that there will be no Southern multinational banks in an equilibrium with unregulated playing fields. In the interest of notational simplicity, we consider the limiting equilibrium where e tends to zero from above.

As in Section IV.A, we continue to assume that precisely μ banking licenses will be allocated in the North and in the South. Since the proportion of sound license applicants in the North under the game of this section is g , the welfare properties of the Northern economy without a level playing field will be the same as those of Section IV.A. The positive certification effect for Northern multinational banks therefore guarantees that welfare will be strictly higher in the North with open rather than closed borders: This compares with the case of Section III.A, where opening borders without leveling the playing field had no effect in the North.

At the same time, bankers who apply for Southern licenses will all have been rejected by the Northern bank, and the proportion of sound license applicants will therefore be g_S , as in equation (12). The negative welfare effect in the South of opening the borders without a level playing field will therefore equal that of Section III.A, as there are no Southern multinational banks.

As in Section III.B, the negative impact of opening borders on the South can be mitigated by international coordination on a level playing field that makes license application equally attractive in the North and the South. Since when the number of multinational banks is set optimally they have the same properties in both countries, MNB size and deposit rates do not require regulation. However, a level playing field requires regulation to ensure that bank size and deposit rates are the same for Northern and Southern local banks. The most effective way to accomplish this is to set both equal to those for the Southern banks in Section IV.A.

Under these conditions, bankers will be indifferent as to where to apply for their first license, so we assume that they apply at home. Thus, with a level playing field, there will be $g\mu$ Southern multinational banks; the presence of these multinational banks has the effect in this case of making the South unambiguously better off with an open economy and level playing fields than it would be with a closed economy. Simultaneously opening the borders and leveling the playing field has two countervailing effects on welfare in the North. First, Northern welfare is reduced by the local bank shrinkage that occurs when playing fields are leveled. Second, Northern welfare is increased by the introduction of multinational banks. Multinational banks therefore go some

way towards reversing the negative consequences of a level playing field for the Northern economy. Proposition 7 formalizes this observation.

PROPOSITION 7: *When economies are opened before initial bank license allocation and multinational banking is possible:*

1. *When there is a level international playing field, Southern welfare is always improved by the presence of multinational banks. When a_S is sufficiently close to a_N , Northern welfare is also higher than it would be in the unregulated playing field (or closed economy) case.*
2. *If a level playing field would be globally preferable to an unregulated playing field in the absence of multinationals, then it is also preferable in their presence.*

The intuition for this result is straightforward. First, Southern regulator certification is most valuable for Northern-domiciled banks when a_S is close to a_N , and further, the lowest common denominator effect is also smallest then. Therefore, the positive welfare effects of multinational banking outweigh the negative effects of level playing fields even in the North, so that opening the border and imposing a level playing field generates a strict Pareto improvement. Second, the positive consequences of multinational banking for the North make level playing fields strictly more attractive with multinational banks than without them.

V. Empirical Discussion

A burgeoning new literature attempts to assess the reasons for foreign bank entry and the impact that such entry has on local banks and local economies (see Clarke et al. (2001) for an excellent survey). Up until now, however, the literature assessing the impact of foreign bank entry has been almost entirely empirical.¹⁶ In this section, we consider how our theoretical model fits in with the available empirical evidence. There are two parts to our discussion: first, we consider whether the assumptions of our theory are likely to be satisfied; second, we consider whether the implications of our theory are consistent with available evidence on foreign entry into banking markets.

On the first issue, the very first question that arises is whether our theory is of any empirical importance: that is, whether there is indeed a significant foreign banking presence in many or most economies. It is easy to answer this in the affirmative. In many emerging economies, foreign banks now hold more than half of all banking assets, and they are also an important presence in

¹⁶ A notable exception is Dell'Ariccia and Marquez (2004). Their focus, however, is completely different from ours. Rather than model the consequences of differential regulatory abilities, they neglect the regulator and consider the consequences of competition between banks with different abilities to screen borrowers. They interpret local banks as having an informational advantage over the foreign banks that enter after liberalization and use this to derive predictions about which sectors foreign banks will choose to enter.

many developed economies. In the United States, for example, foreign banking institutions hold over US\$923 billion in assets, approximately 19% of the total commercial banking assets in the United States.¹⁷ Peek and Rosengren (2000) document the importance of Japanese City banks for commercial real estate markets in New York, California, and Illinois. Thus, the quality of foreign banks relative to domestic ones is becoming an increasingly important issue for domestic regulators.

However, the relevance of the cherry-picking externality identified by our theory depends not only on the *stock* of foreign banks in any given economy, but also on the extent of the *flow* in and out of the banking sector, and the ability and willingness of regulators to influence the quality of this stock by making appropriate licensing decisions.¹⁸ On the first point, there is in fact a surprising amount of turnover in foreign bank representation in many countries, including the United States.¹⁹ Barth, Caprio, and Levine (2001, Figures 21, 22, and 23 and Table 6) provide evidence on bank applications and acceptances around the world in the 5 years prior to their survey of central banks in 2001. A rough treatment of their data suggests that the average reporting country in their sample received just over 10 domestic and 8 foreign applications for banking licenses in the 5 years prior to their survey. Further, regulators do not simply “rubber-stamp” bank entry decisions: Their data show that a significant fraction of bank entry applications are denied, with the fraction of foreign bank applications denied ranging from 6.3% in Europe and Central Asia to 56.92% in South Asia. These data almost certainly understate the extent to which regulators exercise control over banking sector composition, since regulators who would be hostile to foreign entry probably receive very few applications from foreign banks. Moreover, when during the course of a license application it becomes clear that a license application will fail, many applicants withdraw rather than wait to be formally denied a license. Nevertheless, 58 regulators reported denying at least one license. The primary reasons regulators reported for denial

¹⁷ See, e.g., Giannetti and Ongena (2005), and Clarke et al. (2001) for emerging markets numbers. Barth, Caprio, and Levine (2001, Figure 5) illustrate the large variation in the extent of foreign ownership of banking assets for 91 countries. Our calculations using the data they provide at http://www.worldbank.org/research/projects/bank_regulation.htm suggest that of the countries reporting the extent of foreign bank ownership, on average 45% of banking assets were accounted for by banks that are more than 50% foreign owned. See <http://www.ny.frb.org/aboutthefed/fedpoint/fed26.html> for the United States numbers quoted here.

¹⁸ In our model, regulatory influence on bank quality occurs purely at the ex ante stage. In practice, of course, regulators can also influence bank quality by forcing bank exit. Our model can be modified to allow for this extension: See footnotes 2 and 12.

¹⁹ In California in 2003, e.g., of 19 banks with representative offices, 1 representative office was opened, and 5 closed, leaving 15 banks; while of the 49 agencies and branch offices of foreign (other nation) banks (representing 43 banks), 2 branch offices opened, and 3 agencies and 2 branch offices closed, leaving 46 agencies and branch offices (representing 40 banks). In New York State in 2003, among the 87 state-licensed foreign branches operating, 3 new ones were authorized and 3 voluntarily liquidations were concluded; among the 22 foreign agencies, 1 new foreign agency was opened and 2 voluntarily liquidations were concluded. These numbers are down from those at the height of foreign bank activity in the United States, which occurred around a decade ago.

were the “reputation” of the prospective bank (40), followed by “incomplete application” (39), “inadequate capital amount or quality” (32) and “banking skills” (29). These data suggest that, over time, regulators have significant scope to influence the quality of their banking system through appropriate screening of license applicants, particularly in economies where the foreign bank presence is large. Barth et al. also asked regulators about the information that they require to determine the acceptance or rejection of license applications, which typically includes draft by-laws, the intended organization chart, 3-year financial projections, financial information on the main potential shareholders, background/experience of future directors and managers, and the source of the funds to be used to capitalize the new bank. Whilst these survey responses are to a large extent “cheap talk,” and many rejections may in fact occur for corrupt or political reasons, these answers are reassuring in that they are at least consistent with our assumption that regulators try to screen out unsound applicants.²⁰

These observations suggest that the assumptions of our theory are in line with the available evidence. Is the same true of its implications? Unfortunately, any evidence that we are likely to be able to obtain for the certification hypothesis evidence must necessarily be indirect, since banks will clearly avoid the controversy attendant upon a statement that a foreign license application is a response to the regulatory environment at home: Such a statement might be interpreted as a negative comment on the competence of the home regulator or the bank itself. There is a parallel here with the literature on foreign listings by nonfinancial firms: Firms rarely declare publicly that they prefer to list abroad because regulation on the local stock exchange is inadequate, yet this may be *de facto* what they are doing (see, e.g., Reese and Weisbach (2002) and the references cited therein). In the following, we present three sets of evidence relating to the predictions of our model. First, we argue that, if regulators provide a certification service, then banks may wish to operate abroad to benefit from this certification. We present case study evidence that suggests that the entry of Japanese regional banks into the United States in the late 1980s may have reflected just such a desire for certification. Second, our model has positive implications for bank profitability. We confront these predictions with empirical studies of the profitability of foreign versus domestic banks around the world. Third, we compare the normative predictions of our model with the actual regulations adopted. In addition, we also suggest an extension of our theory to allow us to comment on the effect of foreign banks on financial crises in the section following this one.

To separate our certification hypothesis from other potential reasons why banks might locate abroad, it is useful to look at cases where banks did not enjoy any or much profit from the operations of their foreign branches, because then it is clearer that the motivation for applying for a foreign license was not strong business opportunities in the new market. One example of a financial

²⁰ For a reinterpretation of our theory in terms of a regulator that may be corrupt with some probability, see footnote 5.

liberalization in which banks went abroad without making much profit in the new market they entered is the expansion of Japanese Regional Banks into the United States market in the late 1980s and early 1990s. We discuss this example briefly because there is substantial anecdotal evidence to suggest that it illustrates a case in which the main reason for opening foreign branches may have been certification.

At this time, progressive deregulation of the Japanese banking sector was exposing the Regional Banks to competitive pressure from the City Banks in their domestic markets, and so, following liberalization, the Regional Banks looked to expand abroad. By this time, the City Banks already had an important presence in the United States (Peek and Rosengren (2000)), and, accordingly, having a branch in New York was seen as a desirable “status symbol.” Eventually, 26 of the 64 tier I Regional Banks received licenses to open branches in the United States, mostly in New York State. The curious thing about the episode, however, is that very few of these Regional Banks ever did any serious amount of business in the United States, and indeed, it is not clear to what extent they ever had any realistic expectation of doing so.²¹ Why then, did the Regional Banks open branches in the United States? Though there was clearly an initial desire to “follow their customers,” only 3 of these 26 Regional Banks still maintain branches in the U.S. today (5 have converted their branches to representative offices); the others have closed their branches in the United States and Europe, since these “were not profitable enough” and “could not be financially justified” (see Takahashi (1994) and Mandaro (1999)). Thus, following their customers does not seem to be an overriding concern. Instead, it seems likely that setting up these United States branches also enabled the banks to obtain international certification and recognition that was useful to them and that they could not have obtained if they had stayed at home.²²

²¹ Because of consolidated reporting, data on the amount of business done by Japanese Regional Banks abroad is difficult to obtain. However, comparisons of Bank of Japan data on aggregate overseas loans for the sector with data on gross profits and margins in overseas operations reported in the top five regional banks’ annual kessan tanshin suggests that in 1995 and 1996, 5 years after the 26 regional banks entered the United States, these five banks accounted for virtually all of the Regional Banks’ overseas activity. We thank Ken Okamura for suggesting and performing this calculation. In their study of Japanese bank activity in the United States real estate markets, Peek and Rosengren (2000) eliminate the Regional Banks from their data set because although the City Banks were important players in the U.S. real estate market, the Regional Banks, despite their numbers, held less than 4% of the real estate loans. For more qualitative evidence suggesting that Regional Banks were not overly optimistic about the amount of business that they might expect to gain in the United States, see the more extensive discussion in our working paper.

²² For example, Tadaaki Takamizawa, general manager of the New York Branch of the Hachijuni Bank, based in northwestern Japan, which opened a representative office in New York during 1984 and upgraded it to a branch in April 1987, said that in the era of internationalization, his bank needed to be known not only within Japan, but also in the rest of the world (see “Small Japanese banks carving large niche in New York; Riding a wave of internationalization, regional institutions island-hop to Manhattan,” Hitoshi Sugimoto, United Press International, 3 January 1988). A direct example of the value that the Regional Banks placed on certification services per se is provided by the Shizuoka Bank’s reaction to Moody’s rating of its convertible bond issue in 1988 (the first time that the ratings agency had rated any regional bank’s long-term debt): The bank commented that

This example suggests that banks may sometimes choose to locate abroad for certification reasons. This was a particularly dramatic episode, but features of this example are fairly general: The empirical literature has found that, in developed economies, foreign banks often fail to have much impact on domestic markets. And yet banks do sometimes appear to open foreign offices in financial centers merely for “prestige” purposes, without much likelihood of making significant profits from these foreign operations. Representative offices provide the paradigm example of this since they typically employ very few people (sometimes only one or two (see Mandaro (1999)) and are unable to make loans or accept deposits in the host country.

We now turn to the second part of our empirical discussion, where we examine the predictions of our theory for bank profitability, which can more easily be verified in a systematic way. Our theory predicts that banks will be more profitable the higher the quality of the regulator or regulators that certify them, so that other things being equal, domestic banks should be more profitable in an economy with a higher quality regulator. Further, multinational banks should be larger and more profitable than purely local banks from the same country; even if the multinational banks do not do much business abroad, the mere fact that they obtained foreign certification gives the banks credibility with domestic depositors and hence allows them to make more profits on their domestic deposits by lowering domestic deposit rates.

The empirical literature has not yet tested all of these implications. Nevertheless, one puzzling fact that has emerged from this literature is that while foreign banks tend to be *less* profitable and *less* efficient than local banks in developed economies, they are generally *more* profitable and *more* efficient than local banks in developing economies. These observations have led empiricists to conclude that “the reasons for foreign entry [...] differ significantly between developed and developing countries” (Claessens, Demirgüç-Kunt, and Huizinga (2001)). Our paper can provide a single unified theory to understand these apparently contradictory findings, as we now explain.

Suppose that developed country regulators have on average a better ability to screen banks than developing country regulators. This means that local banks in the North will be more profitable and larger than local banks in the South, given equal investment opportunities. In addition, since multinational banks are more profitable than local banks from the same country, it follows that developed country multinationals will appear very profitable compared to their local rivals when they enter developing country markets. Whether the same is true for developing country banks entering developed markets depends, however, on how regulators allocate licenses. If they make license applications too easy, in the sense of Corollary 2, (i.e., they allocate a larger number of MNB licenses than is globally optimal) then developing country multinationals will be of lower quality than developed country multinationals. Further, if the number of developed country licenses issued to developing country banks is

“backed by the higher international credibility obtained from these ratings, the bank aims to raise funds . . . at low costs” (“Bank CB Rated AA3,” Jiji Press Ticker Service, 22 April 1988).

significantly too large, then the quality of developing country multinationals will approach that of developing country local banks, and hence will be lower than that of developed country local banks. Such a situation would generate exactly the pattern of data that has been observed—when developing country banks enter developed markets they do poorly compared to developed country local banks (and of course, developed country multinationals). Note that it is still rational for developing country banks to enter developed country markets, because *they are still doing better than developing country local banks*. Our model thus helps us to understand the empirical finding that foreign (often, developing country) banks seem to be less profitable than local banks when they enter developed economy markets, *without needing to suppose that the reasons for foreign bank entry are necessarily different in developed and developing countries*: In our model entry is driven in both cases by the benefits of foreign certification. This is not to say that we believe that the desire for foreign certification is the only thing, or even the most important thing, that drives foreign bank entry, but it is an effect that most likely arises when entry occurs for other reasons, and that the empirical literature has so far ignored.²³ According to our model, the relevant benchmark for assessing the profitability of foreign bank entry is the profitability of multinational banks compared to that of local banks from the same country, rather than comparing multinational bank profits to those of the banks in the foreign market that they enter.

The reconciliation of our model with the above evidence tends to suggest that it is too easy for developing country banks to enter developed markets—in other words, that developed country regulators are giving out more multinational licenses than would be optimal for developing country welfare. Restricting the number of licenses allocated to banks from these countries would improve the quality of the signal that the license provides, and hence improve developing country bank profits overall. This leads us to a brief discussion of the other normative implications of our theory. The other evidence that regulators actually adopt what our paper predicts is that the optimal regulation is also rather mixed. Consistent with our basic model, many countries have signed on to the Basel Accord's attempt to create a level playing field—moreover, this was, initially at least, an attempt to impose uniform standards across countries with similar qualities of regulation. Further, some countries instead impose tighter regulation, which would also represent good policy-making if their regulators were on average weaker. However, our model suggests that the higher quality of multinational banks should allow them to hold less capital against their deposits and other liabilities than local banks. Few regulators have adopted this

²³ The addition of a fixed cost of foreign entry to our model would generate the plausible result that Northern entry in the South for pure certification reasons is much less likely than Southern entry for certification in the North, since Northern certification adds relatively more value for Southern banks than vice versa. This could help explain why Southern banks might enter Northern markets even if they anticipate low or negative profits there, since such entry will improve their reputation with depositors at home.

regulation.²⁴ Presumably, political constraints make it difficult to ease the capital regulation of (mostly foreign) multinationals relative to that of domestic banks, even if the former are thought to have lower probability of failure. However, it has been argued that the implementation of Basel II will have this effect. This agreement will allow banks to decide whether to opt out of standardized capital regulation similar to Basel I, and instead implement an internal ratings-based approach. Since adoption of the latter in practice requires the bank to incur hefty fixed costs, it is thought that only large (typically multinational) banks will benefit from the looser capital requirements that it will allow. Our theory suggests that if we believe that large multinationals are in fact less likely to fail, this asymmetric impact is in fact a good thing.²⁵

VI. Extensions and Directions for Future Research

A. Banking Crises, Liberalization, and Regulator Reputation

We can interpret a spate of bank failures (i.e., 0 outcomes instead of R outcomes) as a banking crisis. Clearly, banking crises are more likely in the South than in the North in our model, since the pool of banks selected in the South will on average contain more unsound banks. Consistent with this, Demirgüç-Kunt and Detragiache (1998) show that "... high values of the 'law and order' index, which should measure [...] the ability to carry out effective prudential supervision, tend to reduce the likelihood of a crisis." If banking capital is mobile, then the cherry-picking externality imposed by the Northern regulator increases further the likelihood of banking crises in the South. With mobile bank capital, an improvement in the quality of the Northern regulator will (all else equal) cause more crises in the South and fewer in the North, whereas an improvement in the Southern regulator's reputation will reduce Southern crises and have no impact in the North. An international agreement on a level playing field that raises capital requirements and deposit rates in the North and reduces capital requirements in the South will reduce the likelihood of Southern Banking crises, and leave the probability of Northern crises unchanged.

As regulator quality declines, the fraction of the economy's funds deposited in banks must also decline, so the ratio of deposits to GDP will decline. Hence, bank failures are more likely when the ratio of deposits to GDP is low. This effect may explain why Demirgüç-Kunt and Detragiache (1998) find an inconsistent sign on the effect of credit to GDP ratios in predicting banking crises. Although they anticipate that credit *growth* would be associated with financial liberalization and would cause banking crises (see, e.g., Hellman, Murdock, and Stiglitz (2000)), our model shows that credit *contractions* signal poor regulator reputation and hence a greater likelihood of crisis.

²⁴ It is interesting to note that, according to the Barth et al. survey data, Aruba requires local banks to hold 10% capital whereas multinationals need to hold only 8%. Japan, on the other hand, adopts the opposite approach, requiring internationally active banks to hold 8% capital but local banks to hold only 4%.

²⁵ For alternative views on the benefits and costs of the asymmetric impact of Basel II, see Berger (2004), Repullo and Suarez (2004), and Hakenes and Schnabel (2005).

Several papers attempt to assess empirically whether the credit provided by foreign banks contributes to or detracts from banking sector stability (e.g., de Haas and van Lelyveld (2003) for Central and Eastern Europe, and Peria et al. (2002) for Latin America). They find that foreign banks generally raise financial stability, which is consistent with our model, since we argue that multinational banks, with dual certification, are of higher expected quality than local banks and thus are less likely to fail (i.e., less likely to generate 0 rather than R). Relatedly, we predict that multinationals would make higher quality loans than local banks, which is consistent with the more microeconomic evidence provided by Giannetti and Ongena (2005), who find that foreign bank entry into an economy increases industry turnover and stimulates firm growth.

Our model may also help us to see the link between capital account liberalization and financial crises in a new light. Opening the economy to bank capital flows when cherry-picking externalities are present leaves weakly regulated economies vulnerable to shocks from well-regulated economies from which they would otherwise be insulated. In our model, with unregulated playing fields (Section III.A), a shock to the reputation of the Northern regulator will affect the Southern banking system. The impact in the South could be even larger than in the North, where the affected regulator actually operates. For example, the adverse shock to the United States regulator's reputation in the wake of the savings and loan scandal should have been beneficial for emerging economies, whereas the gradual recovery in reputation thereafter may have led to reduced confidence in them. If we take our model literally, confidence in all of these economies' banking systems is intimately bound up with confidence in the developed country regulators' ability to screen out unsound banks.

Our model also points to a potential problem with some standard responses to financial crises. Contagion arises in our model because depositors update their beliefs about the quality of their local banking sector. To be sure, this problem arises because international capital mobility gives rise to a cherry-picking externality, but instances of contagion *do not themselves involve capital flows across borders*. Crises in our model involve capital flight from the banks, but they do not cause, nor are they caused by, cross-border capital flows: The money that leaves the banking sector is hoarded locally. Responding to a crisis by restricting international capital flows or by imposing exchange controls is in our model akin to closing the stable door after the horse's departure.

B. Regulatory Unions and the Benefits of Local Regulators

We have assumed that bank regulators in the North and the South operate independently. However, in the context of our simple model, unifying the regulatory framework would clearly be beneficial. A simple welfare improvement could be achieved by having the more skilled Northern regulator assess applications for Southern banking licenses as well as Northern ones. Moreover, in contrast to work by Dell'Ariccia and Marquez (2005) and Acharya (2003), the Southern regulator would be happy to agree to this change. Even if the Northern regulator cares primarily about Northern welfare and only

lexicographically about welfare in the South, the South will be better off under either unilateral or multilateral capital requirements if the more talented regulator chooses the banks. An even better outcome for both countries can be achieved if both regulators continue to screen license applicants before pooling information and jointly allocating licenses. Arguably, this is achieved to some extent by the multinational banks that we study in Section IV. This observation holds even when regulators are concerned primarily about national welfare: Given either immobility of depositor capital or deposit rationing, Northern and Southern banks do not compete with one another and so there is no conflict of regulatory interest.

When would a regulatory union or regulation by a remote regulator fail to deliver welfare improvements? One plausible circumstance is when local regulators have superior information about local banks: in other words, when regulator screening ability is not the one-dimensional object that we have analyzed, but differs according to the geographical proximity of the bank being screened. For a model along these lines, see Holthausen and Rønne (2002). It might in this case be desirable to keep the two economies as separate regulatory jurisdictions, as we have assumed in this paper. In practice, of course, there are also strong political reasons why an economy may not wish to delegate power over its banking sector to a foreign regulator.

C. Free Movement of Depositor Funds and Exchange Controls

Throughout this paper we have implicitly assumed that depositors may deposit only in their home country. When—as is the case for most of our analysis—deposits are rationed, this assumption is without loss of generality: It would not be possible for the foreign banking system to absorb any more deposits even if depositors were allowed to deposit across national boundaries. Similarly, when deposits are not rationed in either country there is no benefit to depositors from depositing across boundaries if, as we have assumed, they continue to receive their outside option. The ability to deposit overseas is of interest mainly when deposits in one country (i.e., the South, since it has the weaker regulator) are rationed, whereas those in the North are not. It seems clear that in this case, the adverse welfare impact of policies that shrink the Southern banking sector is likely to be smaller because depositors can reallocate their funds to the North instead. Thus, we conjecture the disadvantages of free movement of bank capital and the benefits of level playing fields are both reduced when Southern residents' funds are more mobile. Further, in the simple model presented here, there are no costs to allowing free movement of depositor funds, so we suggest that if capital requirements for Northern banks are not binding, then free movement of depositor funds across borders should be encouraged. This contrasts with the case for free movement of bank capital, which, as we saw in Propositions 2 and 4 above, can be harmful. Of course it can be difficult in practice to distinguish these two types of capital flows, but a policy of exchange controls for the South, where sums above a given limit cannot be easily converted, might be helpful. This may help us to understand why exchange controls are

often adopted by developing countries, although there are obviously a number of other justifications for such a policy.

D. Deposit Insurance

It would also be interesting to investigate the optimal deposit insurance policy in the economies studied in this paper. Elsewhere, we show that *subsidized* deposit insurance schemes are welfare-increasing in this environment—and that weaker regulators should provide more deposit insurance (Morrison and White, 2004). Could more generous deposit insurance schemes be used by weaker regulators as an alternative way of leveling the playing field and making their economy a more attractive location for banks?

It would also be interesting to investigate how the presence of multinational banks should interact with the domestic provision of domestic deposit insurance. A scheme under which all banks operating in a country (whether national or multinational) must contribute to and benefit from the national deposit insurance scheme on an equal basis will tend to level the playing field between national and international banks for two reasons. First, note that insured depositors are indifferent to the failure risk of their banks. As a result, with deposit insurance the sounder multinational banks will no longer be able to borrow at a lower rate than local banks. Second, if all banks pay the same deposit insurance premium the insurance scheme constitutes a subsidy from the sounder multinational banks to the riskier local banks. We conjecture that this net subsidy is most likely inefficient since the multinational investments are of higher average quality.

E. Regulatory Learning

We have assumed throughout our discussion that the regulator's ability to screen license applicants is exogenous. In practice, the regulator may learn how to screen more effectively through contact with other regulators. This suggests a benefit of open economies that is absent from our model: namely, that they encourage regulatory learning and experimentation. This type of argument has been made in the context of other forms of financial regulation; see, for example, Kane (1984) and Romano (2001).

Allowing regulators to make an effort to improve their screening technology in our model is clearly beneficial. With an unregulated playing field, both regulators have an incentive to acquire the better technology and the presence of the cherry-picking externality suggests that the Southern regulator has an especially strong incentive to improve her skills. The Northern regulator, on the other hand, has no particular interest in transferring her skills to the weaker regulator, except insofar as this may improve the quality of multinationals. With a regulated playing field, welfare in both economies is improved if the better regulator can transfer some of her skills to the weaker one, and thereby raise the lowest common denominator. Note that in this case the Northern regulator has an obvious incentive to participate in the transfer of regulatory

technologies.²⁶ In both cases, and in contrast to other literature on regulatory competition (Acharya (2003), Dell’Ariccia and Marquez (2005)), our model predicts a *race to the top* in regulatory quality, rather than a race to the bottom. Whether learning effects mitigate in favor of or against level playing fields is rather unclear; it would be interesting to model the learning process to assess the relative importance of the “catch-up effect” with an unregulated playing field, and the “pull-up effect” with a level playing field. In either case, however, regulatory learning is presumably a fairly long-run phenomenon, so in the medium term, we expect that the effects highlighted in this paper would continue to be important in affecting the trade-off between level and unregulated regulatory playing fields.

VII. Conclusion

In this paper, we examine a model of two countries whose banking sectors with regulators have different abilities to screen license applicants. By deliberately abstracting from many real-world features, we show that important externalities arise between the two countries’ regulators *even when the banks that they regulate do not compete with one another at all*. This is in contrast to much of the recent literature (e.g., Acharya (2003), Dell’Ariccia and Marquez (2003)), which addresses issues of financial integration when foreign banks compete directly with domestic ones and domestic regulators favor their own banks.

One might expect that in the absence of direct linkages between economies, it would be optimal for regulators independently to choose the capital requirements best suited to their local economies. Then, the country with the better regulator can set looser capital requirements than the country with the weaker regulator while still retaining depositor confidence. It follows that banks screened by the regulator with the stronger screening ability are more profitable than banks screened by the weaker regulator because they can attract deposits at lower interest rates, using less capital. While it may be desirable for the better-regulated economy to expand in this way, the problem that arises is that every potential banker will apply first to be regulated by the better regulator, where expected bank profits are higher. This in turn implies that any bank chartered in the worse-regulated economy must have been rejected by the more competent regulator, which reduces public confidence in the banks chartered by the weaker regulator, and shrinks that economy’s banking sector. In other words, the mere existence of the well-regulated economy imposes a *cherry-picking externality* upon the less well-regulated economy. This externality can be sufficiently severe that global welfare will be maximized by setting an international *level playing field*, equalizing capital requirements and deposit rates across the

²⁶ In its 2001 Annual Report, the State of New York Banking Department draws attention to its “leadership role in providing seminars abroad to banking supervisors, sharing its expertise in assessing financial and operational risks.” See <http://www.banking.state.ny.us/report01/Narratives/foreign-banking.html>.

two countries so that potential bankers will be content to apply to their home regulator for a license. Level playing fields benefit the weakly regulated economy and hurt the well-regulated economy, but they increase total surplus when the difference in regulator abilities between the two economies is not too large. This suggests that regulatory accords such as Basel I and II are best restricted to economies with similar regulatory standards. Less well-regulated economies should stay outside the accord and set tighter regulatory requirements. This recommendation is broadly consistent with current international practice, except that according to our model the Basel Accord does not go far enough since deposit rates as well as capital requirements should be harmonized. This latter harmonization may be achieved in practice by international arbitrage by depositors, or by differences in deposit insurance, both of which are absent from our model; we leave this as a topic for future research.

The implication of our result is that allowing mobility of bank capital can be harmful to weakly regulated economies without benefiting well-regulated economies. This result accords well with the casual observation of Hellman, Murdock, and Stiglitz (2000) that in recent years financial liberalization seems to have resulted in both increased international capital flows and a greater incidence of banking crises. One obvious response to this problem is to attempt to close borders to bank capital flows. In the absence of multinational banks, this can be an appropriate policy response in our model, where such international capital flows are simply a conduit for reputational contagion.

We then extended our results to the more realistic case involving multinational banks, which have two banking charters, one from each country. The second charter provides valuable certification for the multinational bank and enables it to operate with lower capital requirements, and to pay lower deposit rates. Although the presence of multinational banks makes local banks shrink, we show that allowing multinational banking always raises welfare in both economies, independently of whether capital requirements and deposit rates are set unilaterally or according to an international level playing field. We also show that even when bank capital mobility gives rise to a cherry-picking externality, allowing multinational banks softens the impact of level playing fields, so that combining international capital flows with a regulatory level playing field strictly raises welfare relative to the closed economy case.

Our model is predicated on the assumption that the competence of the weaker regulator is given. Our model suggests, however, that it would be better for all concerned (including the better regulator) if her ability and reputation could be improved, irrespective of whether playing fields are level or unregulated, of whether multinational banks are permitted, and of whether capital flows are substantial or not. Thus, our paper underlines the importance of the work done by the International Monetary Fund, Bank for International Settlements, and developed country regulators in trying to pass on regulatory skills and best practices to regulators in developing countries in improving global welfare.

Appendix

Proof of Proposition 3: When $a_N < \bar{a}_C$, the respective Northern and Southern welfares are $\gamma_{CN}k(\gamma_{CN})\mu$ and $\gamma_{US}k(\gamma_{US})\mu$. Direct differentiation and some manipulation then gives us

$$\begin{aligned} & \frac{\partial}{\partial a_N}(\gamma_{CN}k(\gamma_{CN})\mu + \gamma_{US}k(\gamma_{US})\mu) \\ &= C(1-g)Rp_L^2\Delta p\mu \left(\frac{1}{M^2(\gamma_{CN})} - \frac{g(1-a_S)}{2-g} \frac{1}{M^2(\gamma_{US})} \right). \end{aligned}$$

Note that

$$M(\gamma_{US}) - M(\gamma_{CN}) = \frac{(1-g)(R\Delta p - C)\Delta p}{2-g}(2(a_N - a_S) + ga_S(1 - a_N)) > 0,$$

and that $\frac{g(1-a_S)}{2-g} < 1$, so that $\frac{\partial}{\partial a_N}(\gamma_{CN}k(\gamma_{CN})\mu + \gamma_{US}k(\gamma_{US})\mu) > 0$, as required for part 1 of the proposition.

When $a_N > \bar{a}_C$ and $a_S < \bar{a}_{US}$, differentiation and manipulation gives us the following expression, from which the second part of the proposition follows immediately:

$$\begin{aligned} & \frac{\partial}{\partial a_N}(N\gamma_{CN} + \gamma_{US}k(\gamma_{US})\mu) \\ &= \frac{g(1-g)(1-a_S)\mu C}{(2-g)R\Delta p} \left(\frac{N}{\mu} \frac{R\Delta p}{C} \frac{2-g}{g(1-a_S)} - k^2(\gamma_{US}) \right). \end{aligned}$$

Finally, for the final part of the result, note that

$$\frac{\partial}{\partial a_N}N(\gamma_{CN} + \gamma_{US}) = N \frac{(1-g)(2(1-g) + ga_S)}{2-g} > 0.$$

Proof of Proposition 5: It is convenient to define expressions N and S for the welfare differences between unregulated and level playing fields in the North and the South, respectively:

$$\begin{aligned} N(a_N, a_S) &= \begin{cases} \frac{(1-g)}{M(\gamma_{CS})M(\gamma_{CN})} R\Delta p^2(R\Delta p - C)\mu\gamma_{CN}(a_N - a_S)p_L, & \text{if } a_N < \bar{a}_C; \\ \frac{\gamma_{CN}}{M(\gamma_{CN})}(R\Delta p\mu p_L - NM(\gamma_{CN})), & \text{if } a_S < \bar{a}_C \leq a_N; \\ 0, & \text{if } \bar{a}_C < a_S. \end{cases} \\ S(a_N, a_S) &= \begin{cases} -\frac{g(1-g)}{(2-g)M(\gamma_{US})M(\gamma_{CS})} CR\Delta p\mu a_N(1-a_S)p_L^2, & \text{if } a_S < \bar{a}_C; \\ -\frac{1}{M(\gamma_{US})}(N\gamma_{CS}M(\gamma_{US}) - R\Delta p\mu\gamma_{US}p_L), & \text{if } \bar{a}_C \leq a_S < \bar{a}_{US}; \\ -\frac{g(1-g)}{2-g}Na_N(1-a_S), & \text{if } a_S \geq \bar{a}_{US}. \end{cases} \end{aligned}$$

The values of a_N and a_S determine whether or not the constraint that bank size is less than N/μ binds, and hence affect the welfare expressions as above. For $\bar{a}_C < a_S$ the constraint binds in the North for both regulatory regimes, and hence the welfare difference N is zero; for $a_S < \bar{a}_C \leq a_N$ it binds in the North with unregulated playing fields but not level ones, and for $a_N < \bar{a}_C$ it never binds. Similarly, the constraint always binds in the South for $a_S \geq \bar{a}_{US}$, binds with level playing fields for $\bar{a}_C \leq a_S < \bar{a}_{US}$, and never binds for $a_S < \bar{a}_C$.

For $a_S \geq \bar{a}_C$ shifting to a level playing field has no effect in the North, and it is therefore trivially preferred. We therefore concern ourselves only with the region $a^S < \bar{a}_C$. The proof of the proposition then consists of a series of lemmas:

LEMMA 1: When $a^S < \bar{a}_C$, $\frac{\partial^2}{\partial a_N^2}(N + S) > 0$.

Proof: Throughout this region,

$$\frac{\partial S}{\partial a_N} = -(1-g)(1-a_S) \frac{R \Delta p \mu p_L^2 C}{M^2(\gamma_{US})} \frac{g}{2-g}.$$

Since

$$\frac{\partial^2}{\partial a_N^2} \left(\frac{1}{M^2(\gamma_{US})} \right) = - \frac{2(1-g)g \Delta p (R \Delta p - C)(1-a_S)}{(2-g)M^3(\gamma_{US})},$$

we have $\frac{\partial^2 S}{\partial a_N^2} > 0$.

For $a_N < \bar{a}_C$, lengthy manipulation yields the following:

$$\frac{\partial^2 N}{\partial a_N^2} = \frac{2(1-g)^2 R \Delta p \mu C p_L^2 \Delta p (R \Delta p - C) M(\gamma_{CS})}{M(\gamma_{CS}) M^2(\gamma_{CN})} > 0,$$

while for $a_S < \bar{a}_C \leq a_N$ it is not hard to show that $\frac{\partial^2 N}{\partial (a^N)^2} = 0$. Q.E.D.

LEMMA 2:

$$\frac{\partial}{\partial a_S} \left((N + S) \left/ \left(\frac{(1-g)R \Delta p \mu p_L}{M(\gamma_{CS})} \right) \right. \right) < 0.$$

Proof: The derivative is trivially negative in the North. In the South,

$$\frac{\partial}{\partial a_S} \left(S \left/ \left(\frac{(1-g)R \Delta p \mu p_L}{M(\gamma_{CS})} \right) \right. \right) = - \frac{C r a_N p_L (\Delta p (R \Delta p - C) - C p_L)}{(2-g)M^2(\gamma_{US})},$$

which is less than zero by assumption (11). Q.E.D.

LEMMA 3: If for some $(\tilde{a}_N, \tilde{a}_S)$, $N + S \geq 0$ then $N + S > 0$ for all $(a_N, a_S) \in Q$, where

$$Q \equiv \{(a_N, a_S) : a_N \geq \tilde{a}_N \text{ and } a_S \leq \tilde{a}_S, \text{ with at least one strict inequality}\}.$$

Proof: Suppose that $N + S \geq 0$ at $(\tilde{a}_N, \tilde{a}_S)$. We show that $N + S$ is increasing throughout Q . Since $N + S < 0$ at $(\tilde{a}_S, \tilde{a}_S)$, there must be a minimum $\tilde{a}_N$ such that $(N + S)(\tilde{a}_N, \tilde{a}_S) \geq 0$ and at this point, $(N + S)$ must be increasing in a_N . By Lemma 1, $(N + S)$ must increase for all $a_N > \tilde{a}_N$ and $(N + S)$ must therefore be positive for all $a_N > \tilde{a}_N$. By Lemma 2, $(N + S)/\frac{(1-g)R\Delta p\mu p_L}{M(\gamma_{CS})}$ is never negative for $a < \tilde{a}_S$ and hence neither is $(N + S)$. Q.E.D.

Proposition 5 follows immediately from Lemma 3 as follows.

If there is no point $(\tilde{a}_N, \tilde{a}_S)$ at which $(N + S) \geq 0$, then λ is negative. If there is such a point, then since $(N + S) < 0$ at $(\tilde{a}_S, \tilde{a}_S)$ there is a minimum a_N at which $(N + S)(a_N, \tilde{a}_S) \geq 0$: Without loss of generality we assume that this point is $\tilde{a}_N$ and hence that $(N + S)(\tilde{a}_N, \tilde{a}_S) = 0$. Lemma 3 implies that $(N + S) > 0$ in the positive quadrant to the SE of $(\tilde{a}_N, \tilde{a}_S)$. If there are, no points outside this quadrant for which $(N + S) \geq 0$ then its boundary is λ . If there are, then Lemma 3 implies that they must lie to the SW or the NE of $(\tilde{a}_N, \tilde{a}_S)$. In other words, the set of points (a_N, a_S) for which $(N + S) = 0$ must always be contained within the SW and the NE quadrant centered at any of the points. Connecting these points must therefore yield an increasing line, as required.

Proof of Proposition 6: When $m \leq g\mu$ it is a straightforward exercise to demonstrate that the derivative of expression (15) with respect to m is

$$\left(\frac{\mu(1-g)}{\mu-m}\right)^2 \frac{(R\Delta p - C)RC(1-a_N)^2 a_S^2 (\Delta p)^2 p_L^2}{M(\gamma_M)M^2\left(\gamma_{LI} + a_f(1-a_f)\max\left(\frac{g\mu-m}{\mu-m}, 0\right)\right)} > 0.$$

Similarly, when $m > g\mu$, the derivative of expression (15) with respect to m is

$$-\left(\frac{g\mu}{m}\right)^2 \frac{(R\Delta p - C)RC(1-a_N)^2 a_S^2 (\Delta p)^2 p_L^2}{M(\gamma_{LI})M^2\left(\gamma_M - a_f(1-a_f)\max\left(1 - g\frac{\mu}{m}, 0\right)\right)} < 0.$$

Proof of Proposition 7: For country $l \in \{N, S\}$ it is convenient to define W_{Ul} to be country l welfare with an unregulated playing field and without multinational banks, W_{Ll} to be country l welfare with a level playing field and without MNBs, and to define W_{MUL} and W_{MLl} to be the corresponding welfares with MNBs. Then

$$\begin{aligned} W_{US} &= W(\mu, \gamma_{US}); & W_{MUS} &= W(\mu, \gamma_{US}); \\ W_{UN} &= W(\mu, \gamma_{CN}); & W_{MUN} &= W(\mu g, \gamma_M) + W(\mu(1-g), \gamma_{LN}); \\ W_{CS} &= W(\mu, \gamma_{CS}); & W_{MLS} &= W(\mu g, \gamma_M) + W(\mu(1-g), \gamma_{LS}); \\ W_{LN} &= \gamma_{CN}\mu k(\gamma_{CS}); & W_{MLN} &= W(\mu g, \gamma_M) + \gamma_{LN}\mu(1-g)k(\gamma_{LS}). \end{aligned}$$

It is obvious that MNBs cause Southern welfare increases when there is a level playing field; Part 1 of the proposition is therefore equivalent to the statement that $W_{MLN} - W_{UN}$ is positive for small enough $a_N - a_S$. Lengthy

manipulation gives us the following, as required:

$$W_{MLN} - W_{UN} = (1 - g)R\Delta p^2(R\Delta p - C)\mu p_L \\ \times \frac{Cp_L a_N a_S (1 - a_N)(1 - a_S) - (a_N - a_S)\gamma_{CN}M(\gamma_M)}{M(\gamma_{CN})M(\gamma_M)M(\gamma_{LS})}.$$

For the second part of the proposition, we demonstrate that the welfare difference between level and unregulated playing fields is smaller with multinational banks than it is without them. In other words, we need to show that $W_{MUN} + W_{MUS} + W_{LN} + W_{LS} - (W_{MLN} + W_{MLS} + W_{UN} + W_{US})$ is negative. Very lengthy manipulation of this expression reduces it to the following expression:

$$-Diff_N - Diff_S,$$

where

$$Diff_N \equiv (1 - g)R\Delta p^2(R\Delta p - C)\mu(a_N - a_S)p_L \\ \times \left(\frac{\gamma_{CN}}{M(\gamma_{CS})M(\gamma_{CN})} - \frac{\gamma_M - a_S(1 - a_N)}{M(\gamma_{LN})M(\gamma_{LS})} \right); \\ Diff_S \equiv \frac{C(1 - g)gR\Delta p^2(R\Delta p - C)\mu a_N^2(1 - a_S)^2 p_L^2}{(2 - g)M(\gamma_{US})} \\ \times \left(\frac{(1 - g)M(\gamma_{LS}) + M(\gamma_{CS})}{M(\gamma_{LS})M(\gamma_{CS})M(\gamma_M)} \right).$$

$Diff_S$ is trivially positive. To see that $Diff_N$ is also positive, note that the denominator in the first bracketed term in the $Diff_N$ expression is less than the denominator of the second term:

$$M(\gamma_{LN})M(\gamma_{LS}) - M(\gamma_{CS})M(\gamma_{CN}) = g\Delta p(R\Delta p - C)\{a_N(1 - a_S)M(\gamma_{CN}) \\ + (1 - a_N)a_S M(\gamma_{CS}) + g\Delta p(R\Delta p - C)a_N a_S (1 - a_N)(1 - a_S)\} > 0,$$

and that the numerator of the first term is greater than that of the second term:

$$\gamma_{CN} - (\gamma_M - a_S(1 - a_N)) = g(1 - a_N)a_S > 0.$$

This concludes the proof.

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