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Asian Finance and the Role of Bankruptcy

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Abstract

The degree to which bankruptcy is permitted to play a role in the allocation of capital is a key distinction between the Asian state-directed financial regime and the western market-directed version. The paper discusses the two approaches to finance and argues that a major problem with the bank-finance model used in many Asian countries is its minimization of bankruptcy risks. A three-sector development model (agriculture, manufacturing, and financial sector) is developed and simulated to compare the outcomes of the two approaches separately and then to evaluate the transition costs of switching from a state to a market-directed financial regime. The simulation results suggest that the market approach results in a higher long-run growth path because it eliminates inefficient firms through bankruptcy. The results also suggest that switching from a state to a market-directed model can be very costly to the economy, though the transition costs can be lowered somewhat by a delayed and phased-in liberalization. At the same time, a delayed and phased-in approach may induce other difficulties not considered in the model. Several policy implications are drawn from the model and simulation results; for example, development of an infrastructure to provide for orderly bankruptcy and the development of money and capital markets should be given high priority in the liberalization process.

I. Introduction

Financial liberalization in many Asian countries has been slow and incomplete. By the end of the 1990s, many elements of the old financial regimes remained in place despite many years of official liberalization policy in most countries. Liberalization policy weakened the close relationship between banks and firms and provided alternatives to bank finance; however, the bank-firm relationship remains significant in Asian financial regimes (e.g., Ostrom, 2000; Spiegel and Nobuyoshi, 2001). In many Asian financial systems, state-directed flow of funds, pervasive deposit guarantees, mutual support, bank finance, and an emphasis on limiting risk and bankruptcy continues to play a prominent role. The slow pace of liberalization rendered Korea, Japan, and other Asian countries susceptible to foreign exchange and bank failure stocks in the 1990s that eventually led to general economic and financial instability in Asia in 1997 and 1998.

The bank-firm relationship and limited alternatives for raising capital support other core elements of the state-directed financial regime, such as non-transparency. There exists a feedback relationship between bank finance and open money and capital markets in Asian financial regimes. The bank-firm relationship constrains the development of open money and capital markets which, in turn, makes it difficult to reduce the bank-firm relationship.[1] Success in reducing the bank-firm relationship will require expanding non-bank methods of raising capital in a more transparent manner that permits a greater willingness to accept bankruptcy as a penalty for poor decision making.

A key objective of the bank-firm relationship in Asian financial systems is to limit risk and minimize bankruptcy.[2] In contrast, western financial regimes accept risk and bankruptcy as an important part of allocating capital. This paper presents a model to investigate the effects of limiting bankruptcy in the real sector and allocating capital based on bank-firm relationships designed to limit risk and bankruptcy. The degree to which bankruptcy is permitted represents a major difference between Asian and western financial regimes. The model focuses on the selective effect that bankruptcy has on the distribution of technological progress, rather than the incentive effect it has on managerial performance. In addition, the model focuses

1 Hoshi and Kashyap (1999), for example, project a large reduction in Japan's banking sector in the next decade if money and capital markets develop to the level they exist in the United States.

2 Other components of the financial system were also designed for this purpose; for example, the Fiscal Investment and Loan Program in Japan was designed to limit risk and bankruptcy for small and medium sized firms that were unable to obtain credit in the private market (Cargill and Yoshino, 2001).

only on bankruptcy in the real sector and not bankruptcy of financial institutions, especially banks. Simulations of the model reveal policy implications for the design of financial structures.

The results demonstrate that Asian or state-directed financial regimes possess a time-inconsistency problem. These regimes achieve high growth in the short run by preventing bankruptcy, but are unable to sustain it in the long run because of the cumulative effects of inefficient surviving investments. Western or market-oriented financial regimes, in contrast, offer higher long-run sustainable growth because they permit bankruptcy, thereby eliminating inefficient firms in the long run and reduce the dead-weight loss on long-run growth. Market-oriented financial regimes are thus less burdened with a time inconsistency problem. The results also demonstrate that high transaction costs are associated with shifting from a state-directed to a market-directed financial system.

The results of the paper reinforce themes in a well-known paper by Krugman (1994), though the framework and focus of the paper are different. According to Krugman, the "Asian miracle" of rapid economic growth in the 1980s was the result of a special set of circumstances that could not be sustained. Specifically, rapid growth was the result of intense applications of capital and labor rather than improvements in efficiency and technology. This maximized growth in the short run at the expense of slower growth in the long run because of diminishing returns. It was only a matter of time before Asian economies experienced slower growth as increased applications of capital and labor to a constant level of technology lowered productivity.

The real issue is why technological progress is not likely to offset diminishing returns and maintain economic growth. This paper argues the problem resides in the particular approach to finance adopted by Asian countries that in one way or another, is based on Japan's financial system. In particular, the bank-firm relationship and the emphasis on limiting bankruptcy contribute to an understanding of why technological progress may not be able to offset diminishing returns over time. In addition, the longer a country relies on the bank-finance model and limiting bankruptcy, the higher the transactions cost of switching to a more market-oriented regime.

The remainder of the paper is organized into five sections. In Section II we compare and contrast market and state-direction financial regimes, the role of Japanese finance as the model for Asian financial regimes, and how Asian financial regimes in general responded to financial liberalization. Section III

discusses the role of bankruptcy in both market-oriented and state-directed financial regimes. In this discussion, we differentiate between bankruptcy in the real and financial sector. Section IV presents the model and the simulation results are presented in Section V. The policy implications and concluding comments are presented in Section VI.

II. Financial Liberalization and the Japanese Financial Regime

Western market-oriented and Asian state-directed financial systems were organized on fundamentally different principles prior to the start of liberalization in the late 1970s, despite the fact that both systems, to varying degrees, limited the role of market forces in allocating funds. In the pre-liberalization period, western financial systems adopted a market perspective in which transactions were short-term and defined by price and quantity. Government influence through interest rates, portfolio diversification, and credit allocation regulations played a significant role; however, the major part of the flow of funds was market sensitive. The financial system was permitted to respond to all demands for credit, as it was viewed as a service industry to consumers and business firms. Western financial systems operated with a high degree of transparency and financial disclosure. Most important, western financial systems operated on the principle that rational credit evaluation and monitoring would result in bankruptcy among borrowers. That is, western financial systems even prior to liberalization incorporated Schumpeter's concept of "creative destruction." The major objective of the financial system was to evaluate and monitor credit, though this was hampered to some extent by government regulation in the form of credit allocation, interest rate ceilings on deposits and lending, and limiting competition between various components of the financial system. Government regulation and the central bank's role as lender of last resort limited bankruptcy among financial institutions and markets to prevent contagion, but nonetheless, government regulation at least in principle, allowed for an orderly exit policy in both the financial and real sectors for institutions that were no longer viable.

In contrast, Asian financial systems adopted a "customer relationship" perspective emphasizing long-term multidimensional relationships that often resulted in credit allocation, evaluation, and monitoring that could not always be rationalized by economic analysis. A major objective was to prevent bankruptcy among the most important firms in the economy through a system of mutual support among financial institutions, business firms, and politicians. While the bank-firm relationship was designed to limit risk and

bankruptcy, the entire focus of financial regulation and supervision was designed to support a financial regime that limited risk and bankruptcy. The concept of creative destruction had no role in Asian financial systems. Financial systems were regarded as part of an overall policy of industrialization and were designed to encourage high saving rates, limit the household sector's access to consumer and mortgage credit, and international isolation. While market forces were not absent, government regulation in the form of interest rate controls and credit allocation were pervasive. Central banking institutions lacked independence and lender-of-last-resort services were often directed to maintaining a no-failure policy of financial institutions and markets. The system was characterized by non-transparency to assist in limiting bankruptcy and enhance the mutual support nature of the system. As Kane (2000) argues, disinformation was used to cover up the costs of politically-directed lending, with the inevitable loss of credibility acting as a potential trigger for silent bank runs and financial crisis.

Japanese Finance

These principles were most clearly reflected in the Japanese financial regime, which in varying degrees served as a model for the majority of Asian financial systems. Japan's occupation of many Asian countries starting with the colonization of Korea in 1908, Japan's occupation of part of China in the 1930s, and Japan's occupation of many Asian countries during World War II, introduced Japanese economic and financial institutions throughout Asia. Prior to Japan's expansion into the Pacific Basin, Asian countries did not have developed financial systems and thus a vacuum existed that made it relatively easy to establish Japanese financial structures despite the less-than-friendly occupation.

In the postwar period, many Asian countries maintained these institutions and further modeled their financial systems after Japan to emulate Japan's rapid growth, macroeconomic stability, and emergence as the second largest economy in the world. The rapid re-industrialization of Japan was impressive by any standard and much of the credit for rapid and stable economic growth was attributed to Japan's financial institutions. Cargill, Hutchison, and Ito (1997 and 2000) provide a detailed discussion of Japanese financial markets and institutions for the postwar period, Cargill (1999) discusses how the Japanese financial system influenced developments in Korea, and Cargill and Parker (2001) discuss the influence of Japan’s financial system on the Chinese financial regime.

The Japanese financial regime that emerged after World War II was the outcome of a process started in 1868. The 1868 Meiji Restoration was a political decision to transform Japan into a modern industrial and military power, to first achieve parity, and then to surpass the west. Japan lacked financial institutions and markets at the start of the Restoration. A national banking system was established in 1872, a postal savings system in 1875, and a central bank in 1882. The financial system was consolidated and subject to greater government control in the wake of the collapse of the banking sector during the late 1920s. Consolidation and government control continued with war mobilization and war in the 1930s and first half of the 1940s, respectively. Over much of this development, Japan's financial system was viewed as an instrument of industrial policy, was designed to ensure a steady flow of credit to support the business sector, and limit bankruptcy among the large firms. The Japanese financial regime reached full maturity in the early part of the 1950s.

The institutions and policy of Japanese finance from 1950 to 1970 were successful by any reasonable standard. The economy achieved real growth rates of 10 percent per year with moderate inflation and by the 1960s had achieved complete re-industrialization. The first part of the 1970s was a turbulent period, but by 1975, macroeconomic policy stabilized the economy and Japan returned to a stable and sustained real growth path in the 3 to 6 percent per year range. Japan's financial and macroeconomic performance from 1975 to 1985 attracted world attention as Japan was able to implement a gradual liberalization process, achieve price stability and sustained economic growth.

Response to Liberalization

Financial liberalization became an ongoing process in the late 1970s when a new economic, technological, and political environment emerged that conflicted with the existing financial structure. The conflict initiated a series of regulatory and market innovations that transformed rigidly regulated and administratively controlled financial systems toward more open and competitive structures. The degree of regulation and administrative control prior to the start of financial liberalization differed across countries. The U.S. financial system, as a representative of the western approach to economic institutions, was among the most open and competitive in the world during the early 1970s, but still limited market forces via a set of binding deposit rate ceilings and regulations that segmented financial institutions and markets. The relationship between banks and firms was less stable and more market oriented, with transactions viewed

by both the bank and the firm from a short-run perspective and defined by price and quantity. In addition, the large and medium sized firms had alternative sources of capital, since money and capital markets were extensive prior to the start of liberalization. In contrast, Asian countries such as Japan and Korea maintained highly-regulated and administratively-controlled financial systems. In particular, the bank-firm relationship was very close. Banks and firms viewed the relationship from a long-run perspective, and defined the relationship to include elements other than price and quantity; for example, it would not be unusual for banks to become involved in firm management or assist a firm to arrange alternative financing to ensure the viability of the firm.

The degree, pace, and policy commitment to financial liberalization also differed across countries. Western financial systems like the United States were more susceptible to financial liberalization for three reasons. First, western financial systems were founded on market principals, there already existed much competition in many sectors of the financial system, and government regulation and supervision was not pervasive. Second, the existence of active money and capital markets and few restrictions on the inflow and outflow of capital constrained the ability of the government to regulate other components of the financial system. Third, western economic institutions in general were more compatible to market principals; for example, bankruptcy was an accepted business outcome and the concept of creative destruction was an accepted by product of the growth process.

Asian financial systems were much less accommodative to financial liberalization. The systems were based on mutual support, non-transparency, and limited competition supported by the bank-finance model. The lack of open money and capital markets combined with extensive restrictions on the inflow and outflow of capital rendered binding government portfolio regulations more difficult to circumvent and reinforced the bank-firm relationship. In hindsight, many Asian countries were unwilling to change the core elements of their financial systems despite the new economic, political, and technological environment. Japan and Korea pursued financial liberalization for example, primarily in response to international pressure, especially from the United States, to permit more competition and open the financial system to foreign institutions and markets. Korea in the 1980s and Japan starting in the late 1970s adopted an official policy of financial liberalization; however, the outcome was often more rhetoric than accomplishment. Lincoln (forthcoming) provides a detailed discussion of why liberalization in Japan, for example, has been slow. Much of Lincoln's analysis applies to liberalization in other Asian countries.

The Asian financial crisis in 1997 and 1998 represented a turning point of sorts for Asian financial systems. The near collapse of the Korean and Japanese financial systems in late 1997 demonstrated the old financial regimes based on mutual support and non-transparency were incompatible with the new environment. Since 1997, both Korea and Japan have made significant progress toward restructuring their financial systems. At the same time, it is still too early to determine whether the process will continue and whether a convergence between western and Asian financial regimes will occur. In particular, the bank-firm relationship remains an important characteristic of Asian finance, and thus while bankruptcy rates have increased significantly in the last part of the 1990s, it is still not clear that Asian regulatory authorities are willing to permit the degree of bankruptcy that exists in market-oriented financial regimes.

III. The Role of Bankruptcy

The role of bankruptcy differs depending on whether bankruptcy is considered from the perspective of the financial sector or the real sector. In the financial system, bankruptcy is constrained by the fiduciary nature of institutions whose liabilities serve as the money supply while, bankruptcy is not so constrained in the real sector. The limited potential for contagion in the real sector permits few constraints on bankruptcy other than providing a legal infrastructure to ensure an orderly exist. Contagion is a more serious problem in the financial system however, and even in a liberated environment, requires special consideration by the government to limit systemic risk.

The role of bankruptcy in the financial system differs between market-oriented and state-directed economies both before and after the start of financial liberalization. Prior to liberalization, bankruptcy in the financial system was constrained by government regulation, supervision, and limits on competition in both market and state-directed systems. The commitment to a "no failure of financial institutions and markets"; however, was stronger in Asian financial systems and in some cases, it was a matter of public policy. For example, Japan experienced no official failures of depository institutions from the start of reindustrialization in the early 1950s to 1991 and regulatory authorities went to extensive lengths to prevent failures. In 1965, Yamaichi Securities Company failed and the Bank of Japan provided funds through the discount window to maintain the Company.

The role of bankruptcy in the real sector, however, differed significantly between market-oriented and state-directed systems prior to the start of financial liberalization. Bankruptcy and the process of

"creative destruction" were accepted in western countries and regarded as a normal process of economic growth. In this regard, the financial system played an important role by evaluating and monitoring credit. In contrast, state-directed financial systems were designed to limit and in many cases, prevent bankruptcy among firms. This is the foundation of the "main bank" system in Japan, which was copied in various forms throughout Asian.

This is best illustrated by the Japanese approach to bank finance. Japanese economic institutions were designed to support industrialization and maintain stable market shares at the expense of higher profits. This resulted in a policy of limiting bankruptcy in the real sector through a complex relationship between banks and business firms referred to as the main bank system, which in turn is a manifestation of the *keiretsu*, or affiliations of firms. Cargill and Royama (1988) attempted to characterize this relationship with flow-of-funds data for Japan and the United States to highlight the difference between market-oriented and state-directed financial systems. They found a fundamental difference between Japanese and U.S. finance. Negotiable indirect financial transactions dominated the flow of funds in Japan, while open market direct financial transactions dominated the flow of funds in the United States.

Financial liberalization elevated the role of bankruptcy in both the financial and real sectors. Systemic risk in the financial system still requires an orderly exit policy for financial institutions that were no longer viable. Financial liberalization, however, highlighted the importance of moral hazard and agency problems that emerged in efforts to limit bankruptcy in the financial system. Thus, regulatory authorities need to permit bankruptcy and allow the market to impose a penalty function of those institutions that are no longer viable. At the same time, the potential for contagion is real and needs to be considered. The solution has been to design regulation to require authorities to act as if the market were imposing bankruptcy-like penalties on financial institutions. The 1991 Federal Deposit Insurance Improvement Act for example, established a "trip wire" system based on capital-asset ratios. As an institution's capital-asset ratio declines, regulatory authorities are required to take increasingly severe actions and when the ratio falls below two percent, regulatory authorities are required to essentially close the institution. Korea and Japan have adopted a less restrictive firm of the trip wire system.

The more fundamental change for Asian financial systems, however, is to allow the market to impose a penalty function on firms in the real sector. Asian financial institutions have historically been designed to support firms via an extensive customer relationship and financial liberalization requires financial

institutions to play a more prominent role in evaluating and monitoring credit. This has not been as serious an issue for market-oriented financial systems since bankruptcy in the real sector has been more widely accepted.

IV. A Model of Capital Allocation and the Effects of Bankruptcy

What effect does bankruptcy and the method of capital allocation have on an economy's growth? The question can be addressed in a simulation model of economic development that incorporates the two approaches to bankruptcy—the state-directed regime that prevents bankruptcy and the market-directed regime that permits bankruptcy. The model developed in this paper expands on the model developed by Parker (1995).

The model developed in this paper differs in three ways. First, the previous model did not incorporate a financial sector. The model is expanded to include a financial regime based on bank finance and models the interaction between banks and firms. Second, bankruptcy was treated as an exogenous variable in the earlier model. Bankruptcy is now endogenous. The model assumes both state and market-directed regimes rely on bank finance, but differentiate between the two with regard to whether bankruptcy is prevented or permitted. Third, the model considers what happens when we switch from a state-directed to a market-directed financial regime.

In this section, we illustrate our arguments comparing financial lending policies with a simulation of a three-sector developing economy comparing two alternative growth paths based on the two methods of capital allocation, and then extend this comparison by considering the problems of switching from the state-directed method to the market-directed method in mid-simulation. There are two real sectors, agriculture and manufacturing, and a financial sector based on bank-finance.

The model begins with a hypothetical economy producing only agricultural products with fixed Cobb-Douglas technology. As a result of savings and capital accumulation, entry and exit, the economy transforms itself into a diversified economy with both agriculture and manufacturing. The manufacturing sector consists of individual small firms with varied technologies.

The Three-Sector Economy

First ,we assume that the labor force is constant. The labor force L equals the sum of farmers (F) and manufacturing workers (M):

(1) $$L = F_t + M_t,$$

where in the initial state $F_0 = L$ (initially, everyone is a farmer). Output of agricultural goods (Q_t^A) is a simple Cobb-Douglas function of the number of farmers and a constant amount of land A:

(2) $$Q_t^A = F_t^a \; A^{1-a},$$

where 0 < a < 1. Thus, we assume for simplicity agriculture exhibits zero technological progress and diminishing marginal product of labor, and all farms are identical in the aggregate. The wage paid to each farmer is equal to the marginal product, so:

(3) $$W_t^A = a\left(\frac{A}{F_t}\right)^{1-a}.$$

Unlike in agriculture, manufacturing output (Q_t^M), cannot be so easily aggregated. Instead, it is equal to the sum of each firm's production:

(4) $$Q_t^M = \sum_{i=1}^{M} q_{it} = \sum_{i=1}^{M} \left(t_{it} \, k_{it}^{\,b} \, m_{it}^{\,1-b} \right),$$

where q_{it} represents the output of the ith firm at time t, t represents its technological level, k is its capital stock, m is its number of workers, 0 < ß < 1, and ß is constant across firms. Because the firm's technology exhibits constant returns to scale, it is impossible to determine the optimal number of firms. Thus, to provide a solution that allows for firm variation we assume that each firm employs one worker/manager/entrepreneur, so that m = 1 and the aggregate number of manufacturing workers equals the number of firms. The income of each manufacturer is:

(5) $$W_{it}^M = t_{it} k_{it}^b - R_t k_{it},$$

where R_t is the rental rate of capital, equal to the depreciation rate d plus the market interest rate. We assume that technology is firm-specific; new firms enter with access to the average technology currently

available, but existing firms innovate new methods which alter their technology for better or worse. We also assume that the result of innovation is random, so that:

(6) $$t_{it} = t_{it-1}\, e^{e_{it}},$$

with the random errors e_{it} distributed normally, with mean μ and variance s^2. We next assume that the relative price of agricultural to manufactured goods is constant, perhaps as a result of trade with the outside world, and so aggregate output in this economy equals:

(7) $$Y_t = Q_t^A + Q_t^M,$$

where gross savings (including any household and firm savings as well as depreciation allowances) is a constant fraction of income:

(8) $$S_t = V\, Y_t.$$

Entry occurs when farmers expect that manufacturing is more profitable, and they leave farming to compete for capital. Farming is assumed to pay its workers their marginal product, so as the number of farmers declines, agricultural wages must increase with predicable certainty. Their future income from becoming manufacturers, however, is not known with certainty. To make this problem tractable, we assume farmers simply form expectations about their potential manufacturing income as:

(9) $$E(W_{t+1}^M) = \left(E(t_t)\, E(K_{t+1})^b\, E(M_{t+1})^{1-b} - E(R_{t+1})\, E(K_{t+1}) \right) / E(M_{t+1}),$$

The expected manufacturing wage is thus the expected value of output, less capital costs, per manufacturer. We solve for E(t) as the current output-weighted level of technology, and the expected capital stock as:

(10) $$E(K_{t+1}) = \left(\sum_{i=1}^{M} k_{it} \right) (1-d) + S_t.$$

The capital stock of existing firms is assumed to depreciate at the annual rate d. The expected return to capital is calculated as the marginal product of capital for the aggregate manufacturing sector, assuming identical technologies across firms in order to aggregate the production function, so that:

(11) $$E(R_{t+1}) = b\, E(t_t) \left(\frac{E(M_{t+1})}{E(K_{t+1})} \right)^{1-b}.$$

Finally, E(M_{t+1}) is found through a Walrasian tattonment process by beginning with the existing number of firms, solving for both the agricultural wage and the expected manufacturing wage for that particular amount of *M*, and then repeating the process as long as:

$$E(W^{M}_{t+1}) > W^{A}_{t+1}(1 + \Omega), \text{ where } W^{A}_{t+1} = a\left(\frac{A}{L - E(M_{t+1})}\right)^{1-a}. \quad (12)$$

We assume there is some small adjustment cost to entry and exit, equal to a fraction O of the agricultural wage. The assumption of a small transactions cost to entry or exit stabilizes firm turnover rates; without it, small perturbations lead to the majority of firms exiting and then immediately re-entering the manufacturing sector.

The Allocation of Capital

Using the model just described, we compare two basic strategies of capital allocation:

1) *A "state-directed" strategy*, which we believe reasonably approximates the Asian state-directed banking approach. New firms may enter the manufacturing sector with a purchase of capital equal to the previous period's per-capita income. Savings (less that used for new firm startups) are allocated to existing firms based on their previous period's share of output, a policy that favors established firms but also rewards those firms with better technology. Since capital is not allocated in a market process, rental rates for capital are assumed to be firm-specific, and equal to the firm's marginal product of capital. Unprofitable firms or firms with low marginal product of capital are not shut down.
2) *A "market-directed" strategy* that approximates the western, approach to banking. Existing firms are allocated capital according to their expected marginal product. We limit new firm lending to the previous period's per-capita income, we do not allow lending to more than double a firm's capital stock in any one period, and we do not allow lending to firms that are currently unprofitable.

In the market model, because firm-specific technology prevents a direct solution, we use another Walrasian tattonment process to find the rental rate that clears the market. Beginning with the expected

return to capital calculated in equation (11), the rental rate is arbitrarily raised by fifty basis points and then dropped in increments of one basis point until the demand for additional capital (defined as the firm's optimal level of capital less the firm's existing depreciation-adjusted capital stock), summed over all firms, ceases to exceed the supply of savings.

In the market model too, banks are assumed to force bankruptcy on unprofitable firms. Since we assume there is a transaction cost for exit, at the end of each period we shut down all firms for which:

We implicitly assume, therefore, that current firm profits, which depend in large part of the firm's level of technology, are the best predictor under uncertainty of the firm's future profits. When a firm is shut

$$t_{it} k_{it}^{b} - R_t k_{it} < W_t^A (1 - \Omega). \quad (13)$$

down, its worker returns to agriculture, its capital stock is lost, and the bank's loan is uncollectible.

Switching Methods

The model allows us to simulate each approach over time. The model also allows us to determine the effects on economic development of a switch from one approach to the other. Since liberalization involves the transition of finance from state-directed to market-directed approaches, we investigate what would happen if a country started out using the state-directed strategy, but at some point decides to switch regimes What would be the effects of such a switch in capital allocation strategies?

To answer this question, we run a switching simulation in which the state-directed approach is used for periods 1–25, and then, in a sudden change, the market method is used for periods 26–50. This approach to liberalization is termed "Switch 1." We then consider two alternative approaches, in which financial sector reforms are sequenced. Liberalization commences at an earlier date in "Switch 2." After period 20, instead of period 26, the banking system no longer allocates new capital to unprofitable firms. In "Switch 3," the banking system starts liberalization after period 20, but continues to support firms so that from period 21–25, banks allocate capital according to expected marginal product without yet imposing bankruptcy on existing insolvent firms. In Switch 2 and 3, the switch to market-directed finance is completed in period 26.

How would the financial sector be affected by these alternative switches in policy? We model the cash flow of the financial sector by assuming that firms repay the principal of their loans at the rate of depreciation, and these depreciation allowances are included in national savings. Banks earn interest equal to the previous period's capital stock times the difference between the rental rate and the depreciation rate. Banks lend out all additions to savings, but must write off as a bad debt expense the value of any bankrupt firm's lost capital stock, current interest and principal repayment.

V. Simulation and Results

We use a Monte Carlo approach to determine the sensitivity of economic growth performance to changes in bankruptcy rates and other underlying parameters. In our model bankruptcy is endogenous, and we use a single set of parameters and a single set of random error terms for illustrative purposes, and to more easily compare strategies. In the agricultural sector, we set L=1000, A=1000, and a=0.50, so labor and land have equal output elasticities and initially make equal contributions to output. The technology parameters (t_{i1}) of new manufacturing firms are initially set to 1, though later entrants will enter at the mean rate and be able to take advantage of technological progress. Random error terms (50 periods · 1000 potential firms = 50,000 terms) are generated using the normal distribution, with μ=0 and s=0.04, so there is no inherent tendency for manufacturing technology to improve relative to agriculture technology except through selection. The output elasticity for capital (ß) is 0.75 for all firms. The savings rate (?) is 0.15, the depreciation rate (d) is 0.10, and the transaction cost (O) for entry and exit, as a share of the wage, is set to 0.30.

With the parameters set, we run the simulation once through, from period 0 to 50, for each of the following six cases:

1) the state-directed or non-market strategy;
2) the market-directed strategy;
3) Switch 1 which represents a simple and complete switch from the state-directed strategy to the market-directed strategy (i.e., simple financial liberalization) after period 25;
4) Switch 2, in which insolvent firms no longer receive infusions of capital after period 20 and are allowed to fail with a complete switch is made after period 25;

5) Switch 3, in which banks also begin to use market rationing to allocate capital after period 20 but do not impose bankruptcy, with a complete switch after period 25; and
6) Switch 3 with a 5-period delay, beginning after period 25 with a complete switch after period 30.

How do the state-directed and the market-directed strategies compare? Table 1 shows values for major variables for three years in the sample (1, 25, and 50) as well as the overall mean, for both the state-directed and market-directed approaches. Our simulation suggests that the market approach to capital allocation results in faster technological progress due to greater selection pressure, while the non-market approach leads to initially faster capital accumulation. This is the same result obtained by Parker (1995); however, the current model with a financial sector and endogenous bankruptcy provides a greater degree of robustness to the result and provides insight into how bankruptcy changes over time. Bankruptcy rates grow slowly as the dispersion of technology grows, and as a result the state-directed approach never results in higher consumption than the market approach, even initially. Technology does improve much faster in the market approach, but it is not entirely stagnant in the state-directed approach since firms with better technology produce more output and thus receive more capital, and the average technology used by new entrants is weighted by output. Because the market approach leads to higher output, it also enables the economy to generate more capital even as bankruptcy absorbs capital.

In both the market and non-market approaches, we see a transformation from an agricultural economy to an agricultural-manufacturing economy; however, the transformation is more rapid with the market approach. In both market and non-market approaches, wages rise as technology improves and capital is accumulated, with wages rising faster in the market approach. The average return to capital falls over time in the non-market model, but rises in the market model.

The advantages of a market approach become more apparent over time. What if policymakers who have already chosen the non-market strategy decide to switch strategies at some point? Our results suggest that such sudden financial liberalization can be disastrous. As is shown in Table 2 (including also the values for years 20 and 26–30), a simple switch from non-market to market strategies results in severe recession that lasts for five periods, with most firms going bankrupt, a solvency rate that declines dramatically as a result, a crash in the capital stock, a loss of over half of consumption (and output), a movement of labor back into agriculture, a decline in wages, and a jump in the rental rate of capital. Average technology, on the

other hand, rapidly improves, and because so many firms go bankrupt the average technology of the remaining firms briefly exceeds that achieved by the market-based approach. Within twenty years, however, the economy recovers back to, and then exceeds, the consumption level it would have had without the switch, and is also achieving faster rates of growth in its capital stock. In addition, the financial sector will decline from a simple switch. In the both the market and non-market approaches, the financial sector's net cash flow is positive, but it is greater in the market approach. A simple switch from state to market-directed finance, however, generates financial distress. The financial sector suffers three years of heavy losses as bad debts are written off. Financial cash flow eventually recovers, but the average cash flow is much less over the entire duration of the simulation than with either of the two approaches considered separately.

Can the recession be softened by appropriate sequencing of reforms? Our simulation suggests the effects of switching can be reduced. With either Switch 2 or Switch 3, which begin five years before full financial liberalization with transitional policies to more efficiently allocate new capital stock and/or cease supporting insolvent firms, the resulting recession is reduced in length and severity. However, the recession is still significant. Switch 2 causes a four-year decline of consumption to a level 43 percent below the amount in period 20 (while simple financial liberalization resulted in a five-year decline to a level 49 percent below period 20) even though it led to slower growth from period 20 through period 25. Switch 3 led to a four-year decline in consumption of only 32 percent relative to period 20, in part because it led to more rapid growth from period 20 to 25 (20 percent compared to 14 percent).

The improvement in performance with Switch 3 suggests that better results occur when the transition is commenced earlier and phased-in to avoid a "cold turkey" impact on the economy. Yet policymakers lack perfect foresight, and starting earlier may instead translate into further delaying full financial liberalization, which in turn may lead to greater transition costs. To illustrate this, we compare simple financial liberalization after period 25 with implementation of Switch 3 at the same time (with full financial liberalization to follow after period 30). The results, shown in Table 3, suggest that delaying financial liberalization may be costly. Under the simple switch, consumption grows by 14 percent from period 20 to 25, declines by 55 percent from period 25 to 30, and grows by 66 percent from period 30 to 35. Under the delayed Switch 3, consumption grows by 14 percent from period 20 to 25 and 18 percent from period 25 to 30, and declines by 45 percent from period 30 to 35. From period 35 to 50, both strategies result in identical growth rates, but the delayed switch begins at a base that is 13 percent lower.

Finally, the performance of four key variables (consumption, technology, bankruptcy rates, and solvency rates) are shown in Figures 1–4, comparing all six strategies discussed above. In Figure 1, Switch 3 appears to be the second-best strategy only if the alternatives are to delay financial liberalization or not to switch at all. In Figure 2, switching appears to lead to sudden jumps in the average technological level that almost catch up (in the long run) to market values. Figure 3 shows that liberalization leads to very high bankruptcy rates which are eased by sequencing, but worsened by delay. Figure 4 shows that liberalization leads first to significant declines in solvency, then significant improvements.

VI. Implications and Conclusions

The simple model and simulations described above do not constitute a proof that market-directed financial regimes that permit bankruptcy are preferable to state-directed financial regimes that prevent bankruptcy. However, the model and results do illustrate an argument that a market-based strategy of capital accumulation does a better job of selecting for better technologies and inducing more rapid growth in the long-run, and that financial liberalization starting from a state-directed base, while necessary for long-run growth, can be very disruptive.

Several policy implications emerge from the analysis. First, regulatory authorities in Asian countries would benefit from less reliance on the type of financial system developed by Japan and emulated by many other Asian countries. These financial systems are designed to limit bankruptcy in the real sector, and bankruptcy serves an economically important function. Second, while the bank-finance model is not inherently inefficient in the abstract, the bank-finance model in the absence of alternatives forms of allocating capital, provides the basis for a policy of preventing bankruptcy because the close relationship between banks and firms encourages informality, non-transparency, and mutual support. Asian regulatory authorities should adopt policies that reduce the importance of the type of bank-firm relationship that evolved in Korea and Japan, for example. Third, establishment of money and capital markets is important since they encourage transparency, enhance the channels of finance, weaken the bank-firm relationship, contribute to internationalization of finance among other advantages. Money and capital markets are not merely another policy of liberalization, but represent a regime shift that supports market forces throughout the financial system. The limited development of money and capital markets in Asian countries supports the continuation of the bank-finance model and all of its associated characteristics, the most important being the minimization

of bankruptcy. Fourth, financial liberalization requires an extensive bankruptcy infrastructure to provide for the orderly closing down of insolvent firms and the disbursement of assets and disposition of liabilities. Fifth, policies need to be implemented to render firms more responsive to their shareholders to impose discipline on troubled firms and reduce the potential for the bank-firm relationship to conceal problems. Sixth, specific consideration needs to be given to the transaction costs of shifting from a state-directed to a more market-oriented financial system. Advocates of market-oriented financial systems have frequently underestimated the difficulty of shifting from one regime to another and as a result, have not paid sufficient attention to minimize the transaction costs of switching. It is incorrect to transfer the results of liberalization in say the United States with those that can be anticipated in a state-directed financial regime. Even prior to liberalization, the United States permitted bankruptcy and thus, enhancing competition did not result in a fundamental change in the core of the financial regime. In contrast, liberalization in Japan or Korea, which have traditionally prevented bankruptcy, resulted in transition costs that were significantly understated when based on the U.S. liberalization process. Under our admittedly-simple assumptions, financial liberalization has the potential to be very disruptive. The model and simulation results, while simple, carry a strong message. Policymakers who are currently considering financial liberalization should carefully weigh their strategies.

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TABLE 1: A Comparison of Non-market and Market Strategies

Non-market Capital Allocation Strategy

Period	M	T	C	K	BCF	W	R	BR	SR
1	40	0.999	924	150	66	0.510	0.538	0%	100%
25	566	1.120	2319	3057	1246	0.759	0.524	0%	46%
50	765	1.252	3518	5380	2203	1.031	0.490	0%	40%
Mean	*518*	*1.123*	*2303*	*3001*	*1222*	*0.768*	*0.529*	*0%*	*43%*

Market Capital Allocation Strategy

Period	M	T	C	K	BCF	W	R	BR	SR
1	40	0.999	924	150	66	0.510	0.539	0%	93%
25	594	1.344	2558	2623	1344	0.785	0.685	8%	65%
50	891	1.831	6146	6304	4259	1.514	0.823	5%	67%
Mean	*565*	*1.366*	*2927*	*2908*	*1659*	*0.867*	*0.675*	*5%*	*70%*

Note: Simulation results are shown for the number of manufacturers (M), the output-weighted average technology (T), the amount of consump tion expenditures (C), the capital stock (K), the financial sector's cash flow (BCF), the wage rate (W), the rental rate of capital (R), the bankruptcy rate (BR), and the solvency rate (SR).

TABLE 2: A Comparison of Switching Strategies

	Simple Financial Liberalization						Change 2						Change 3					
Period	T	C	K	BCF	BR	SR	T	C	K	BCF	BR	SR	T	C	K	BCF	BR	SR
1	0.999	924	150	66	0%	100%	0.999	924	150	66	0%	100%	0.999	924	150	66	0%	100%
20	1.084	2039	2534	1014	0%	45%	1.084	2039	2534	1014	0%	45%	1.084	2039	2534	1014	0%	45%
25	1.120	2319	3057	1246	0%	46%	1.152	2285	3049	1222	0%	39%	1.209	2438	3090	1417	0%	44%
26	1.160	2409	3160	-530	51%	34%	1.189	2356	3145	-316	49%	31%	1.227	2511	3201	507	43%	43%
27	1.263	2169	2244	-1147	75%	8%	1.283	2242	2427	-1556	73%	5%	1.289	2611	3015	-1058	58%	8%
28	1.356	1626	1158	-891	91%	4%	1.358	1469	912	-583	78%	5%	1.358	1967	1708	-932	67%	5%
29	1.425	1179	435	-387	94%	1%	1.417	1171	425	308	1%	74%	1.352	1389	752	500	0%	95%
30	1.452	1036	231	181	0%	91%	1.422	1293	586	404	2%	81%	1.358	1508	921	605	1%	82%
35	1.512	1719	1075	796	2%	75%	1.480	1950	1429	956	5%	71%	1.417	2119	1759	1109	3%	71%
50	1.778	4394	4093	2967	5%	67%	1.755	4416	4198	2963	5%	68%	1.676	4287	4277	2754	7%	69%
Mean	*1.301*	*2044*	*1845*	*895*	*8%*	*54%*	*1.291*	*2107*	*1958*	*959*	*6%*	*54%*	*1.267*	*2173*	*2099*	*1021*	*5%*	*54%*

TABLE 3: The Effects of Delaying Liberalization

	Simple Liberalization after Period 25						Switch 3 after Period 25					
YR	T	C	K	BCF	BR	SR	T	C	K	BCF	BR	SR
1	0.999	924	150	66	0%	100%	0.999	924	150	66	0%	100%
20	1.084	2039	2534	1014	0%	45%	1.084	2039	2534	1014	0%	45%
25	1.120	2319	3057	1246	0%	46%	1.120	2319	3057	1246	0%	46%
26	1.160	2409	3160	-530	51%	34%						
27	1.263	2169	2244	-1147	75%	8%						
28	1.356	1626	1158	-891	91%	4%						
29	1.425	1179	435	-387	94%	1%						
30	1.452	1036	231	181	0%	91%	1.270	2737	3612	1690	0%	38%
31							1.286	2813	3721	502	50%	39%
32							1.364	3076	3661	-2005	66%	3%
33							1.424	2059	1733	-1095	76%	2%
34							1.424	1379	686	486	3%	73%
35	1.512	1719	1075	796	2%	75%	1.438	1499	839	580	3%	87%
50	1.778	4394	4093	2967	5%	67%	1.680	3818	3609	2450	6%	67%
Mean	*1.301*	*2044*	*1845*	*895*	*8%*	*54%*	*1.253*	*2092*	*2079*	*933*	*5%*	*51%*