FINANCIAL COLLUSION AND OVER-LENDING

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Working Paper No. 02-W29R

September 2002
Revised October 2003

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First version: September 2002
This version: October 2003

Abstract

We build a model consisting of a borrowing firm, a lending institution (bank), and a third party influencing loan decision-making (auditor/government regulator) where a low-type firm can bribe the auditor to file an untruthful report about its true type so as to obtain a loan from the bank to finance a risky project. The main finding is that, depending on the economic environment, the bank may or may not want to deter such a collusion. This implies there may be a sudden shift from a collusion to a no-collusion equilibrium as the economic environment deteriorates. The combination of noticeable gradual deterioration in fundamentals and expectations of a sudden equilibrium-shift can trigger aggressive speculative attacks and passive withdrawals of investments even before the actual equilibrium-shift takes place. We apply this hypothesis to the case of the 1997 Korean financial crisis that features a severe over-lending problem.

JEL Classification Numbers: D82, G30, O16.

Keywords: collusion, financial crisis, dishonest auditors, over-lending

Acknowledgment: We would like to thank to Been-Lon Chen, William J. Collins, Mario J. Crucini, Curt Hunter, Sung-Hyun Kim, Jong-Wha Lee, and Henry Wan for their valuable comments and suggestions.

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I. Introduction

While theory may be ahead of measurement in some areas, measurement seems always ahead of theory in the study of financial crises. The most recent Asian financial crises started in July 1997 have reassured such an assertion. In terms of fundamentals, financial crises may be divided into at least four broad categories: (i) financial illiquidity and bank runs (Diamond and Dybvig, 1983, and Chang and Velasco, 2001), (ii) monetary expansion and collapse of the fixed exchange rate regime (Krugman, 1999a and Obstfeld, 1994), (iii) monetization of government debts and collapse of the fixed exchange rate regime (Flood and Garber, 1984, and Burnside, Eichenbaum and Rebelo, 2001), and (iv) moral hazard in the loans market and lending boom (Corsetti, Pesenti and Roubini, 1998, IMF Survey, 1998, and Krugman, 1999b). Overall, there lacks a consensus on the primary driving forces underlying these crises. Due to its scale and timing, however, the occurrence of Asian financial crises is generally believed propelled by self-fulfilling prophecies (Radelet and Sachs, 1998).

The main purpose of the present paper is to investigating how over-lending as a result of collusion between financial institutions and borrowing firms may distort normal borrowing-lending operation (*e.g.*, causing a discernible shift in loan composition from more to less productive investment projects) and subsequently expedite an economy-wide crisis.[1] This complements the existing financial crisis models based on self-fulfilling prophecies, which rely exclusively on adverse-selection/moral-hazard problems or participation externalities.

Just how relevant is the bank-firm collusion problem? Japan is known with a long history of the related lending problem since the bond underwriting cartel (Kisaikai) established in 1933. Weinstein and Yafeh (1998) and Morck and Nakamura (1999) provide strong evidence suggesting that such a close bank-firm tie need not lead to higher profitability. Two recent empirical studies by Bae, Kang and Kim (2002) and La Porta, Lopez-de-Silanes and Zamaripa (2003) argue persuasively that the prevalent related

[1] Both Radelet and Sachs (1998) and Krugman (1999b) suggest such a possibility without a complete analytic characterization.

lending in Korea and Mexico, respectively, is likely a consequence of tunneling or looting, with significant resources diverted from depositors to some insiders. These observations provide a solid support to the validity of the approach undertaken in this paper.

For illustrative purposes, let us call the formal authority of loan decision-making a bank and the real authority an auditor (or a government regulator).[2] An auditor's favorable report would grant the approval of the loan automatically for the borrowing firm of unknown quality to undertake a risky project whose returns depend on an idiosyncratic shock. As an outside alternative to making the loan, the bank can invest in the world capital market where a fixed rate of return is guaranteed. This portfolio decision depends on a comparison of the expected returns on the risky project with the safe returns on investments in the world capital market. While both the firm's type and the state of nature are unobservable to the bank, we for simplicity assume that the auditor can detect the true type of the firm. Thus, the auditor possesses valuable information which the bank has an incentive to purchase and a low-type firm has an incentive to conceal. Whether the auditor ends up revealing this information depends on which party (the lender or the borrower) offers a higher payment. If it is the firm, there is a financial collusion.[3]

Depending on the primitives of the economic environment, the bank may *optimally choose not to deter collusion*. Therefore, over-lending, caused by financial collusion, can be an equilibrium outcome, thus contrasting sharply with the conventional theory of looting (cf. Akerlof and Romer 1993) and tunneling (cf. Johnson, La Porta, Lopez-de-Silanes and Shleifer 2000). The intuition of this result can be more easily understood from the following illustration. Suppose the chance of receiving a favorite idiosyncratic shock is high (good economic environment), the value of knowing the true type of the

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[2] The reader is advised to take the auditing process simply as an illustrative story, as we will elaborate in the concluding section that the model framework is far more general than it appears – one can easily apply it to cases with the auditor replaced by a government bureaucrat or a bank loan officer who has different objective from the bank owner.

[3] Thus, the case of corruptive government can be regarded as a special case where the bribes are sufficiently large for the collusion to emerge. For a survey of theoretical formation of collusion, the reader is referred to Tirole (1992).

borrowing firm will not be high enough for the bank to deter the collusion between the firm and the auditor, thus resulting in a *collusion equilibrium*. When the economic environment is bad, knowing borrower's true type becomes very valuable to the bank and the bank will optimally deter the collusion by paying the auditor more, leading to a *no-collusion equilibrium* where the bank invests in the world capital market upon meeting a low-type borrower. It is important to note that in which equilibrium an economy settles depends on the underlying economic environment, which differs from sunspot models of self-fulfilling prophecies and is more consistent with the evidence provided in Calomiris and Gorton (1991).[4] Our theory implies that a *continuously* deteriorating economic environment will lead to a *discrete* equilibrium-shift eventually.

We then undertake a case study of the 1997 Korean financial crisis. We identify that the over-lending problem, particularly from *non-bank financial institutions* to *Chaebols* (large conglomerates) especially after the liberalization of the capital account, is a major source of the crisis. Our theory thus provide a plausible explanation for the occurrence of the financial crisis in Korea: the combination of gradual but noticeable deterioration in fundamentals and the expectations of a sudden equilibrium-shift would trigger aggressive speculative attacks and passive withdrawals of investments, which can take place prior to the actual equilibrium-shift.

Related Literature

The present paper is related to the broad literature discussing the relationship between financial intermediates and real economic performance. In general, active financial intermediaries promote economic growth by providing effective liquidity and risk managements as well as by preventing unprofitable investments and loan defaults. However, in the presence of participation externality and fixed entry cost, it is possible that an active financial market participation may lead to a harmful effect on

[4] Calomiris and Gorton (1991) find a wide range of evidence inconsistent with the sunspot view that banking crises are purely expectations-driven random events.

the real economy (cf. Besci, Wang and Wynne, 1999). Along the lines of research on overinvestment-induced crisis, there are some studies emphasizing on the increasing vulnerability in a domestic financial market to exogenous shocks (Corsetti, Pesenti and Roubini, 1998, Radelet and Sachs, 1998, and, Krugman, 1999a). With regard to the methodology, two closely related papers are Akerlof and Romer (1993) and Kofman and Lawarree (1993). Akerlof and Romer argue that when government guarantees the liabilities of financial institutions, bank owners may have a moral hazard problem, going bankrupt under some circumstances and causing net losses to the society (i.e., what they describe as a "looting" behavior, undertaking bankruptcy for profit). Kofman and Lawarree examine the emergence of collusion between a manager and an auditor using a principal-agent framework within a firm.

The main difference between our paper and the earlier literature is that we study in depth the underlying mechanism that gives rise to a collusion equilibrium featuring excessive lending to less productive firms. In contrast with Akerlof and Romer, we allow the possibility that a bank may optimally choose not to deter a collusion between the borrowing firm and the auditor. Thus, overinvestment in low-return projects can occur in equilibrium, even without a safety net provided by the government. In contrast with Kofman and Lawarree, we consider the lending relationship between a bank and a firm with a third party seeking rent on providing information about firm's type. Moreover, since it may be a bank's best interest not to setup an incentive compatible contract, over-lending may occur without the typical crowding-out effect from loanable funds reallocation.

II. The Model Economy

Our model consists of three risk-neutral optimizing players: firms, banks and auditors. For simplicity, we restrict our attention to the case where each bank can make a loan to exactly one firm and hire exactly one auditor. This one-to-one relationship enables us to focus on the behavior of a "representative" firm-auditor-bank trio. The story can be outlined as follows. The firm initiates an investment project which requires external financing from the bank. In the presence of asymmetric information about this firm's type, the bank hires an auditor to investigate whether it should approve the

loan. The primary goal of this paper is to construct this theoretical framework to help understand whether and under what conditions a financial collusion between a firm and an auditor is possible. In the rest of this section, we describe the decision by each agent and the timing of events.

A. The Firm

The firm is owned by a risk-neutral optimizing entrepreneur.[5] Without loss of generality, it is assumed that each entrepreneur is financially constrained and cannot undertake an investment project without bank financing. For simplicity, we normalize the size of the project to one (which may represent any given amount of a particular consideration). Upon receiving a loan, an entrepreneur undertakes the investment project with a rate of return depending on his/her type as well as the state of nature.

We consider two types of entrepreneur: high (h) and low (l). A fraction π are high-type entrepreneurs who always undertake their projects with high effort, from which they incur disutility measured in monetary equivalence, c. On the contrary, low-type entrepreneurs (fraction $1-\pi$) always undertake their projects with low effort and incur no disutility.

In addition to the entrepreneur's type, the output of an investment project Y also depends on an idiosyncratic productivity shock which can be "good" (g) with probability p, or "bad" (b) with probability $(1-p)$. The output levels associated with high/low-types and good/bad states are given by:

Output		State of Nature	
		g	b
Effort	h	$1 + H$	$1 + L$
	l	$1 + L$	1

[5] It is assumed that each firm has an entrepreneur who runs the firm and acquires all profits. In this respect, the terms "firm" and "entrepreneur" will be used interchangeably throughout this paper.

or, $Y(h,g) = 1+H$, $Y(h,b) = Y(l,g) = 1+L$, and $Y(l,b) = 1$, where $L<H$. We assume banks observe neither borrowers' type nor the state of nature. Notice that our setup implies even output is observable, the bank cannot tell in the case of $Y = (1+L)$ whether it is a result of a bad state or a low-type entrepreneur. Due to this asymmetric information, a low-type entrepreneur may be able to bribe an auditor to get his/her loan approved by the bank.

B. The Auditor

Auditors are specialized in uncovering entrepreneurs' true types. Upon an investigation, the participating auditor submits a report to the bank stating the audited entrepreneur as either a high- or a low-type. Among all auditors, a fraction α are honest and always tell the truth, and the remaining fraction $(1-\alpha)$ of dishonest ones may lie about the true type of low-type entrepreneurs. Particularly, a dishonest auditor always reports truthfully when he/she meets a high-type entrepreneur, but may report "high" when he /she meets a low-type entrepreneur, depending on the associated payoffs.

The objective of an auditor is to maximize his/her expected net payoff. In the case of an honest report, the auditor is compensated by a transfer payment from the bank (*t*) for auditing. If an auditor files a dishonest report, his/her income consists of a side-payment (*s*), or a bribe, from the low-type entrepreneur and when his/her dishonesty is undetected, a compensation *t* from the bank – that is, a dishonest report earns nothing from the bank when the output turns out to be unity.[6] This may be regarded as a passive punishment imposed on a dishonest auditor.

C. The Bank

The bank is endowed with an amount of funds normalized to one, which can be used to finance a risky investment project conducted by an entrepreneur of an unknown type or invested in the world

[6] As in Tirole (1992), the side-payment agreement is assumed enforceable and non-renegotiated.

capital market to earn a fixed rate of return B (>0). The bank can set the amount of payment to the auditors (t) and the interest rate (R) to maximize its profit. However, the actual payment and returns are a bit more complicated than they seem. First, as mentioned earlier, if the output level turns out to be unity, then the bank can infer that the auditor lied and therefore does not need to pay t. Second, the amount that a bank can collect from funding a risky project is bounded by the realized output level due to the assumption of limited liability. For example, when the output level is one, the bank can only recover the principal. Since our goal is to study under what conditions collusion can happen, without loss of generality, we can confine R to be less than L so that low-type entrepreneurs are not deterred per se.

Assumption 1: $R \# L$.

We are now ready to be more specific about what we mean by "over-lending".

Assumption 2: $pH \% (1 \& p)L \& c > B > pL$.

This assumption implies, from social planner's viewpoint, it is socially efficient to only have the high-type entrepreneurs undertake the risky project. Therefore we refer "over-lending" to the situation where low-type entrepreneurs are financed by banks and undertake the project.[7]

Notice that Assumption 1 and 2 together imply $B > pR$. That is, if banks knew borrowers' type, it would not be their interest to lend their funds to low-type entrepreneurs as they always have the option to invest in the world market and earn B. Under informational asymmetry, however, banks' loan decision must rely on auditors' report.

D. Timing of Events

The timing of events can now be summarized as follows:

[7] Notice that it is socially inefficient simply because the low-type entrepreneurs cannot produce enough, in expected term, to cover the opportunity cost of the resource. Another possible inefficiency resulting from the misallocation of fund, namely a "crowding-out" effect, is absent from this setup.

(i) the representative entrepreneur applies for a bank loan to initiate an investment project prior to the productivity shock;

(ii) the representative bank employs the representative auditor to investigate the entrepreneur's type prior to making the loan decision;

(iii) the entrepreneur and the appointed auditor can sign a side-payment contract and then the auditor reports (truthfully or dishonestly) the entrepreneur's type to the bank;

(iv) should the auditor's report be high, the bank approves the loan and the entrepreneur engages in the risky project and the shock is then realized and; should the auditor's report is low, the bank invests in the world capital market and earns a riskless return B;

(v) upon the realization of output, the entrepreneur pays back the loan (either $1\%R$ or 1), and if the auditor's report is high but the entrepreneur's type is low, the side-payment (s) is transferred from the entrepreneur to the auditor;

(vi) the auditing compensation (t) is paid by the bank except the case where the auditor reports dishonestly and output turns out to be one.

III. Incentive-compatibility and Participation Constraints

We start to analyze each player's decision-making. A dishonest auditor chooses between lying and telling the truth. An entrepreneur decides whether to undertake the risky project and if he/she is a low-type, how much he/she can afford to bribe an auditor. A bank owner determines (i) whether to engage in the risky project at all and (ii) if the answer is positive, how to set the interest rate (R) and the transfer payment to the auditor employed (t) so as to maximize the expected profits. Our analysis consists of two steps. In the following subsection, we assume banks to take (R,t) as exogenously given and thus focus on auditors' incentive-compatibility constraint, entrepreneurs' participation constraint and banks' participation constraint. In the next subsection, we proceed by allowing banks to choose the optimal contract (R,t).

A. Auditors' Incentive-compatibility Constraint

The expected profit of a representative entrepreneur of a particular type (high or low) is equal to the expected output net of the loan repayment, the effort cost (positive if he/she is of high-type) and the side payment to bribe a dishonest auditor (positive if he/she is of low-type). Denoting E as the mathematical expectation operator, the expected profit of a high-type entrepreneur is:

$$\mathrm{E}[\Pi_h] = pH + (1-p)L - R - c, \tag{1}$$

whereas provided that a potential dishonest auditor would accept bribes and report dishonestly to get the loan approved, the expected profit of a low-type entrepreneur is:

$$\mathrm{E}[\Pi_l] = (1-\alpha)[p(L-R)-s], \tag{2}$$

The probability for such collusive behavior to occur is simply the probability of meeting a dishonest auditor, $(1-\alpha)$. A low-type entrepreneur is willing to provide a bribe only if his/her expected profit (net of the side-payment, *s*) is positive. From (2) by setting $\mathrm{E}[\Pi_l] = 0$, one can obtain the maximum level of side-payment that a low-type entrepreneur is willing to bribe an auditor $(s^{\max})$,

$$s^{\max} = p(L-R). \tag{3}$$

When a dishonest auditor receives a side-payment offer, he/she may decide to take it by reporting dishonestly if accepting the bribe is proven profitable. Thus, when the auditor reports honestly, he/she will receive a payoff of *t* for certainty. When a low-type entrepreneur offers a bribe, a dishonest auditor may choose to accept it to receive an expected payoff of: $\mathrm{p}(t+s)+(1-p)(0+s) = s+pt$. The difference between these payoffs, $s-(1-p)t$, measures the incentive to accept the bribe - that is, if this payoff differential is positive, a dishonest auditor is willing to accept the bribe offer. This implies that the minimal level of bribe that a dishonest auditor is willing to accept $(s^{\min})$ can be derived by driving this payoff differential to zero,

$$s^{\min} = (1-p)t. \tag{4}$$

By comparing $s^{\max}$ and $s^{\min}$, we can easily decide if a pair of (R,t), given p and L, leaves a room for bribery. If the amount that a low-type entrepreneur can afford does not exceed what a dishonest auditor requests ($s^{\max} \# s^{\min}$), collusion is impossible. Assuming that collusion does not occur when a dishonest auditor is indifferent between lying and telling the truth, we can use (3) and (4) to derive the *auditors' incentive-compatibility constraint*, or *no-collusion condition*, as:

$$t \$ \frac{p}{1\&p}(L\&R). \tag{5}$$

this condition states, in order for the dishonest auditors to reveal true information, banks need not only to outbid low-type entrepreneurs' offer $(p(L\&R))$, but also to pay them a premium so that they do not gamble on the unverifiable case (when output is $(1\%L)$). Otherwise collusion will happen, so we can write the *collusion condition* as:

$$t < \frac{p}{1\&p}(L\&R). \tag{5'}$$

Figure 1 shows these two inequalities in (R, t) space.

B. Entrepreneurs' Participation Constraints

We next turn to investigating entrepreneurs' participation constraints which ensure their expected returns are nonnegative. Notice that under the assumed repayment schedule, low-type entrepreneurs always desire to and will participate in investing in the risky project if the combination of (R,t) allows room for bribery. Our only concern is therefore the participation constraints facing high-type entrepreneurs – in order for them to initiate the project, the repayment (R) must be sufficiently low. Using (1), we can derive a *high-type entrepreneur's participation constraint* as follows:

$$R \# pH\%(1\&p)L\&c. \tag{6}$$

C. Banks' Participation Constraints

Provided an active participation of high-type entrepreneurs, we can examine banks' lending decision under two different scenarios, depending on whether the combination of (R,t) allows for bribery or not. If auditors' incentive-compatibility constraint (5) is satisfied, all auditors will report honestly. Therefore a participating bank's profit will depend on the type of entrepreneur matched and its expected profit will be

$$\Pi_N = \pi R + (1-\pi)B - t \tag{7}$$

where the subscript "N" represents the case of "No-collusion". Instead of investing in the riskless project, a bank will try to make a loan to a high-type entrepreneur if $\Pi_N \geq B$. From (7), a *bank's participation constraint under no collusion* can thus be written as:

$$t \leq \pi(R-B). \tag{8}$$

The left-hand-side of (8) is the cost of engaging the risky project whereas the right-hand-side is the expected benefit.

If $t < \frac{p}{(1-p)}(L-R)$, dishonest auditors will lie about the true type of low-type entrepreneurs, under which a participating bank's profit becomes

$$\Pi_C = [\pi + (1-\pi)(1-\alpha)p]R + [(1-\pi)\alpha]B - [1-(1-\alpha)(1-\pi)(1-p)]t. \tag{7'}$$

Here, $[\pi + (1-\pi)(1-\alpha)p]$ in the first term is the sum of the probabilities of the two cases with repayments (i.e., the output must be either $1+H$ or $1+L$): (i) π indicates the probability of finding a high-type entrepreneur; and (ii) $(1-\pi)(1-\alpha)p$ the probability of meeting with a low-type entrepreneur and employing a dishonest auditor who mis-reports to have the loan approved, but the state of nature turns out to be good – in either case, the net returns to the bank will be R. The probability $[(1-\pi)\alpha]$ in the second term is associated with the case where the bank meets a low-type entrepreneur and an honest

auditor, under which it chooses to invest its funds to the riskless project and earn B. The last term is bank's expected transfer payment to the auditor. Notice that with probability $[(1-\alpha)(1-\pi)(1-p)]$, the state of nature is bad and in this case, the bank is capable of detecting the entrepreneur's true type and the false report by a dishonest auditor, thus refusing to pay the auditing fee.

As long as this expected profit is greater than the reservation value B, the bank is willing to make a loan to the entrepreneur. Therefore we can derive *bank's participation constraint under collusion* as

$$t \geq \frac{\pi+p(1-\pi)(1-\alpha)}{1-(1-\pi)(1-\alpha)(1-p)}R - \frac{1-\alpha(1-\pi)}{1-(1-\pi)(1-\alpha)(1-p)}B. \qquad (8')$$

D. Collusion and No-Collusion Sets

To summarize, we define a no-collusion set **N(v)** as all combinations of (R,t) for a given parameter configuration $\boldsymbol{v} \in (H,L,B,c,p,\pi,\alpha)$, such that collusion is deterred and bank's and high-type entrepreneurs' participation constraints are both satisfied. That is,

$$\mathbf{N}(\boldsymbol{v}) \in \{(R,t)\text{: (5), (6), (8) are satisfied.}\}.$$

For the case with collusion, we can define a collusion set **C(v)** in a similar fashion:

$$\mathbf{C}(\boldsymbol{v}) \in \{(R,t)\text{: (5}\mathbb{N}\text{), (6), (8}\mathbb{N}\text{) are satisfied.}\}.$$

An example is illustrated in Figure 2 where the upper-right shaded area represents set $\mathbf{N}(\boldsymbol{v})$ and the lower-left set $\mathbf{C}(\boldsymbol{v})$. One should know that, depending on the parameter configuration $\boldsymbol{v}$, either set or both could be empty.

IV. Collusion Equilibrium

We have studied possible combinations of (R,t) that result in collusion. By permitting banks to choose R and t, we now examine whether they are capable of deterring collusion by designing and

implementing an incentive mechanism and whether it is their best interest to do so if they are able to. Our goal is to show that it is not always so – that is, under some conditions, collusion can arise endogenously. For the rest of the paper, we focus primarily on a special case where there is no honest auditor ($\alpha = 0$) – in this case, banks have the greatest incentive to deter collusion.[8] Under this simplification, (8') becomes:

$$t \geq R - \frac{1}{\pi(1-\pi)p} B, \tag{8''}$$

and other conditions involved in defining sets $\mathbf{N}(\boldsymbol{v})$ and $\mathbf{C}(\boldsymbol{v})$ remain the same.

A. Collusion as Banks' Inability to Deter

The first case is when banks cannot deter it, collusion can arise. In other words, there does not exist any combination of (R, t) that satisfies both banks' and high-type entrepreneurs' participation constraints and leaves no room for bribery (i.e., $\mathbf{N}(\boldsymbol{v}) = \varphi$). This is shown in Figure 3, from which we derive the underlying set of parameters to support this outcome,

$$\frac{B}{\pi(1-\pi)p} \geq pH - (1-p)L - c < \frac{pL - (1-p)\pi B}{\pi(1-\pi)p}. \tag{9}$$

Notice that since $pH - (1-p)L - c$ is the highest interest rate that high-type entrepreneurs can afford, banks' total revenue under collusion cannot exceed $[\pi(1-\pi)p][pH - (1-p)L - c]$. If the first inequality in (9) is violated so that this maximal revenue cannot even cover banks' opportunity cost B, then banks will withdraw from the loan market and both collusion and no-collusion sets will be empty. The second inequality in (9) is less straightforward – it states that the maximal interest rate $[pH - (1-p)L - c]$ a bank can charge is so low that it cannot prevent the low-type entrepreneurs from

[8] A discussion of the general case with $\alpha > 0$ is relegated to a corollary at the end of this section.

bribing the auditor under the maximum level of compensation t that is permissible.

Given (9) is satisfied, banks' profit-maximization problem can be written as:

$$\max_{\{R,t\}} \Pi_C \text{ ' } [\pi\%(1\&\pi)p](R\&t) \qquad (10)$$

$$\text{subject to} \quad (R,t) \text{ 0 } \mathbf{C}(\boldsymbol{v}).$$

This is a problem of linear programming; using Figure 3, we can solve a bank's optimal decision below,

$$R_C^{(} \text{ ' } pH\%(1\&p)L\&c \quad ; \quad t_C^{(} \text{ ' } 0.$$

Intuitively, given collusion will occur, auditors provide no information to banks and therefore any positive payment from banks to auditors cannot be justified ($t_C^{(} \text{ ' } 0$). Additionally, the optimal interest rate $R_C^{(}$ should be set as high as possible without deterring high-type entrepreneurs. From (7'), the resulting profit is given by,

$$\Pi_C^{(} \text{ ' } [\pi\%(1\&\pi)p][pH\%(1\&p)L\&c].$$

Summarizing,

> **Proposition 1:** *If the underlying parameter configuration* $\boldsymbol{v}$ ' $(H,L,B,c,p,\pi,0)$ *satisfies (9), then banks cannot deter collusion and optimally set* $\mathrm{R}_C^{(} \text{ ' } pH\%(1\&p)L\&c$ *and* $t_C^{(} \text{ ' } 0$.

In this case, collusion arises because banks are incapable of deterring it.

B. Collusion as Banks' Unwillingness to Deter

The next question is that suppose banks are able to deter collusion, is it their best interest to do so? The trade-off that banks face then is to pay auditors high t so that they will reject the bribe or to pay them none but suffer from possible collusion.

Suppose the parameter configuration satisfies

$$\frac{B}{\pi(1-\pi)p} < \frac{pL(1-p)\pi B}{\pi(1-\pi)p} + pH(1-p)L-c, \tag{11}$$

then both $\mathbf{N}(\boldsymbol{\nu})$ and $\mathbf{C}(\boldsymbol{\nu})$ are non-empty. Since a participating bank's profit-maximization problem will be exactly the same as (10) whenever they permit collusion, their correspondent choices are R_C^* and t_C^* which result in profit level Π_C^*. When banks choose to deter collusion, they set (R,t) to solve

$$\max_{\{R,t\}} \Pi_N = \pi R(1-\pi)B-t \tag{12}$$

$$\text{subject to} \quad (R,t) \in \mathbf{N}(\boldsymbol{\nu}).$$

This is again a linear programming problem and from Figure 4, the solution of (R,t) turns out to be:

$$R_N^* = pH(1-p)L-c \quad ; \quad t_N^* = \max\{0, \frac{p}{1-p}(L-R_N^*)\}.$$

When $t_N^* = 0$, or equivalently $c \le p(H-L)$, the disutility from putting in high effort is so low that banks can elicit high-type entrepreneurs simply by setting a high enough interest rate. In other words, banks do not need the information provided by auditors and collusion cannot occur in equilibrium. To find the condition under which banks optimally choose not to deter collusion, we can focus on the case when $R_N^* < L$, or $c > p(H-L)$. In this case, the resulting profit for banks is

$$\Pi_N^* = \frac{\pi(1-\pi)p}{1-p}[pH(1-p)L-c](1-\pi)B-\frac{p}{1-p}L.$$

Denoting $R^* \equiv pH(1-p)L-c$, we can calculate the profit differential between no-collusion and collusion as:

$$\Pi_N^{(} \& \Pi_C^{(} \text{ ' } (1\&\pi)(B\&pR^{(}) \& \frac{p}{1\&p}(L\&R^{(}), \tag{13}$$

which is negative if

$$[pH\%(1\&p)L\&c] < \frac{pL\&(1\&\pi)(1\&p)B}{p[\pi\%(1\&\pi)p]}. \tag{14}$$

Note that we can interpret the first term in the right-hand-side of (13) as how much banks value the information whereas the second term as the cost of acquiring it. It is clear that banks will choose not to purchase any information from auditors if its cost exceeds the benefit. Combining conditions (11) and (14), Proposition 2 states the condition under which banks optimally choose to allow collusion to arise in equilibrium without imposing an incentive mechanism:

Proposition 2: *If the underlying parameter configuration* $\boldsymbol{v}$ ' $(H,L,B,c,p,\pi,0)$ *satisfies*

$$\frac{pL\%(1\&p)\pi B}{\pi\%(1\&\pi)p} \# [pH\%(1\&p)L\&c] < \frac{pL\&(1\&\pi)(1\&p)B}{p[\pi\%(1\&\pi)p]}, \tag{15}$$

then banks will optimally choose not to deter collusion.

C. Existence and Characterization of Collusion Equilibrium

From Propositions 1 and 2, we obtain the main Theorem that determines when collusion will arrise – whether it is due to banks inability or unwillingness to deter it:

Theorem: *If the underlying parameter configuration* $\boldsymbol{v}$ ' $(H,L,B,c,p,\pi,0)$ *satisfies*

$$\frac{B}{\pi\%(1\&\pi)p} \# [pH\%(1\&p)L\&c] < \frac{pL\&(1\&\pi)(1\&p)B}{p[\pi\%(1\&\pi)p]}. \tag{16}$$

then a collusion equilibrium will emerge.

One can see from (16) that a decrease in B or an increase in π would make the first term smaller and the last term greater so that (16) is more likely to be satisfied. Intuitively, this economy will tend to settle in the collusion equilibrium if: (i) B is small so that banks' cost of lending money to low-type entrepreneurs is low and (ii) π is large so that the chance of being matched with low-type entrepreneurs is low.

Furthermore, an increase in p will make the first inequality in (16) more likely to hold since the riskless project now becomes more unappealing and therefore it is unlikely for banks to choose it over the collusive outcome. What happens to the second inequality in response to an increase in p is more complicated as it results in two effects. First, banks' expected return from financing low-type entrepreneurs' projects is now higher and therefore they are more reluctant to deter collusion. The second effect is concerned with banks' cost of detecting low-type entrepreneurs (t). On the one hand, since low-type entrepreneurs' expected return from undertaking a project becomes higher, given the same R they are able to make a higher offer to bribe the auditors. On the other hand, however, banks will charge a higher interest rate, $pH+(1-p)L-c$, under a higher value of p. As a consequence, it is not clear whether it becomes easier or more difficult for banks to outbid low-type entrepreneurs. It turns out that the first effect always dominates the second one, and therefore the second inequality in (16) is more likely to hold under a higher p. That is, when the economy environment is favorable (high p), banks will tend to allow collusion.

So far in this section, we have assumed there is no honest auditor in this economy $(\alpha = 0)$, which describes the most severe situation for collusion equilibrium to emerge. The following corollary relaxes this assumption:

Corollary: *If the underlying parameter configuration* $\boldsymbol{v} = (H,L,B,c,p,\pi,\alpha)$ *satisfies*

$$\frac{[1-\alpha(1-\pi)]B}{\pi+p(1-\pi)(1-\alpha)} \geq [pH+(1-p)L-c] < \frac{pL-(1-\pi)(1-p)(1-\alpha)B}{p[1-(1-\pi)(1-p)(1-\alpha)]}. \qquad (17)$$

then collusion equilibrium will emerge.

Straightforward differentiation shows the first term in (17) decreases with α, whereas the last term increases with it; in other words, (17) is more likely to hold when α is larger. This implies that banks tend to choose collusion equilibrium if the fraction of honest auditors is high.

V. Application: A Case Study of the 1997 Korean Financial Crisis

We now undertake a case study of the case of Korea and then illustrate how our theory may provide a plausible explanation for its 1997 financial crisis.

A. General Economic and Financial Development

We summarize from Tables 1, A1, A2 and Figures 5-7 four useful observations prior to its 1997 crisis:

(Obs1) there were negative fundamental shocks in the real sector: its growth rate declined in 1996 (from an average of 7.5% over 1990-95 to 6.8% in 1996) and its trade deficits continued to increase since 1993 (reaching approximately 5% of GDP in 1996), though the inflation rate was rather steady (around 6%) and the government budget deficits were moderate (averaged only 0.23% of GDP during 1990-96);

(Obs2) its financial sector exhibited a lending boom (measured at 17% over 1990-96), with relatively low internal financing ratio (particularly, 21.8 % for large enterprises with 300 or more employees, much lower than comparable figures in Taiwan – a competing country at a similar development stage), much higher financial leverage (396% compared to 86% in Taiwan), and a relatively high percentage of non-performing loans (16%);

(Obs3) its currency, won, suddenly depreciated in 1996 (by 8.9%, though maintaining a relatively constant real effective exchange rate based on the J.P. Morgan data) and its stock prices suddenly dropped during 1996 (by 26.2 %);

(Obs4) there were no sizable foreign debt accumulated (from 13 to 18% over 1990-96, higher than those

in Taiwan but acceptable by international standard) nor severe illiquidity problems (with the short-term liabilities towards the Bank of International Settlement, or, BIS in short, to total liabilities ratio at an acceptable 67%).

After the crisis, one can further observe:

(Obs5) there were significant depreciation in won and decline in stock prices (while won lost half of its nominal value and 48% of its purchasing power from the end of 1996 to the end of 1997, the stock price index decreased by 46%);

(Obs6) while growth declined sharply (from 6.8% in 1996, to 5.0% in 1997, to a historically low -6.7% since the first oil crisis), trade deficits continued (measured -2.4% of GDP in 1997) and foreign reserves shrank (by US$ 14 billions in 1997, or, about one month of total imports of that year);

(Obs7) inflation was quite stable (from an average of 6.0% over 1990-96, to 5.9% over 1997-98 and to 1.6% over 1999-2000).

In summary, these observations have painted a fairly clear picture as follows: (i) the causes of 1997 financial crisis in Korea were not purely non-fundamental, though the crisis might likely be magnified by pessimistic expectations and society-wide losses in confidence (see Obs1-Obs3); (ii) financial illiquidity and monetary/fiscal policy-led collapse of the fixed exchange rate regime were unlikely to be the major sources of the crisis (see Obs1, Obs4 and Obs7); and, (iii) by eliminating alternative hypotheses, it seems reasonable to conclude that excessive lending provided by financial institutions was most probably responsible for the crisis.[9] To support the last argument, we must examine the financial structure of the Korean economy more thoroughly, to which we now turn.

B. Financial Structure

Financial collusion and over-lending in Korea may be best illustrated by the following editorial

[9] The empirical relationship between overinvestment (combined with production inefficiency) and recent financial crisis in Asian countries is widely discussed. See, for instance, Coresetti, Pesenti, and Roubini (1998), IMF Surveys (1998), and Krugman (1999b).

highlight of a major national newspaper:

"*For a long time have Korean companies been engaged in unbridled expansionism financed through loans, inefficient octopus style management, and over and duplicate investment, thus expediting the structural failure of the economy. This failure to concentrate on profits, consolidation and efficiency provided the fuse to the bankruptcy bombs that triggered the foreign exchange and economic crises. ... The collusion between the conglomerates, financial sector and politicians made this financial monopoly possible.*" (Chosun Ilbo, December 26, 1997)

In particular, the turmoil in Korea was primarily triggered by continual bankruptcies of *Chaebols*, which had borrowed heavily from financial institutions in financing their investment projects. Unlike some other Asian countries experiencing problems in their financial sector due to shifts in investment projects toward real estates (such Japan, Hong Kong and Thailand), *Chaebols* in Korea concentrated mostly on manufacturing activities (cf. Coresetti, Pesenti and Roubini, 1998).

Historically, there have been favorable credits towards large enterprises, which reflected the intimacy between financial institutions and *Chaebols* (as reported in Table 1, the average internal financing ratio of large enterprises was much lower than that in small and medium enterprises). Indeed, banks in Korea, compared to those in Hong Kong, Singapore and Taiwan, have paid more attention to their merits measured by the size of loan services, which inevitably leads to over-lending. In particular, after the liberalization of capital account in 1991, external liabilities (including external debts, off-shore borrowing of Korean banks, and borrowing in foreign currency by Korean banks' oversea branches) began to grow from US$6.2 billions to US$164 billions from 1992 to 1996, where almost 3/4 of them were borne by financial institutions (see Table 2).

First, we note that the market structure of financial institutions is crucial for the vulnerability of the over-lending problem in Korea. From Table 3, the shares of banking institutions (commercial and specialized banks) on deposit and loan markets in Korea have declined in the past two decades, from

70.9% and 63.3% to 27.8% and 37.9%, respectively. Their roles had been replaced by non-banking financial institutions (NBFIs) in a fast pace. While the Bank of Korea had complete supervisory authority over commercial banks and appropriate levels of controls over specialized banks, the supervision on NBFIs had never been clearly institutionalized. Due to the absence of limitations on ownership regulations, those large *Chaebols* owned a significant portion of NBFIs. With poor monitoring, the rapid growing in the businesses of NBFIs had been a result of their excessive-lending to formally affiliated or informally colluded *Chaebols*, illustrating a course of crony capitalism.

Next, by reviewing the financial status of top 30 *Chaebols* in Korea at the end of 1996 (see Table 4), one can easily identify the tendencies of over-lending to *Chaebols*. In fact, the net profits of the 30 largest *Chaebols* were close to zero, with 13 of them running negative profits. Financial leverage (the debt to equity ratio) was uniformly high for all *Chaebols*, ranging from 191 (Lotte) to 8,599% (Jinro). Implicit government safety net for financial institutions under the notion of "too big to fail" together with a weak supervisory system resulted in excessive risk-taking. After the financial crisis, 12 financially weak *Chaebols*, including Daewoo, Ssangyon, Kia, Halla, Donga Const., Jinro, Dongguk Jaekang, Haitai, New Core, Sammi, Sinho Jaeji, and Hansin Kongyong, had either declared bankruptcies or been in the insolvency state by the end of 1999. It may be interesting to highlight a strong relationship between the likelihood of bankruptcy and financial leverage: financial leverage of the 12 *Chaebols* declaring bankruptcies or facing insolvency averaged 1563.9%, much higher than the comparable figure of 482.6% of the other 18 *Chaebols*. Thus, financially weaker *Chaebols* had borrowed more excessively from financial institutions.

Among these NBFIs, two big development institutions, Export-Import Bank of Korea (EIB) and Korea Development Bank (KDB), provided loans with relatively lower interest rates (compared to commercial and specialized banks) using government funds, special debentures and foreign capitals.[10]

[10] The Bank of Korea defines two development institutions providing medium- and long-term loans or credit for development of three key sectors: export parts and components industries, high-tech

Due to their low-rates offerings, EIB and KDB had attracted a large fraction of lending business in the 1990s. Table 7 shows the composition of total loans in Export-Import Bank of Korea, where the total amount grew rapidly from $1,285 billion won in 1991 to $7,540 billion won in 1997, more than 6 times over a short 6-year span. Putting these numbers in perspective, the total amount of loans in 1997 provided by just EIB was more than 10% of the government budget and almost 1% of the entire GDP of the Korean economy. A more striking observation is: the top four *Chaebols* (Hyundai, Samsung, Daewoo, and LG) together borrowed from 52.4% (in 1997) to 73.8% (in 1993) of total amount of loans provided by EIB, showing a strong financial collusion between the these largest *Chaebols* and the EIB. Even more surprisingly, the percentage of loans provided by EIB to three large *Chaebols* in the state of bankruptcy or insolvency (Daewoo, Halla and Kia) rose from 15.0% in 1995 to 23.6% in 1996, just before the crisis, and dropped only back to approximately the 1995 level (14.4%) at the end of 1997 right after the crisis.

In summary, the evidence suggests that in view of the lending relationship between large *Chaebols* and NBFIs, (i) the over-lending problem in Korea prior to the crisis was severe; (ii) such excessive loans were provided to fund investment projects of low returns; and, (iii) the absence of an effective supervisory system and the lack of a financial regulation on the ownerships of NBFIs by *Chaebols* encouraged crony capitalism.

C. *From Theory to Practice*

Upon understanding an important underlying driving force of Korea's financial crisis occurred in 1997, we now turn to illustrating the relationship between financial collusion and bank over-lending, to which we now turn. To establish the connection between over-investment and financial collusion in a convincing manner, we must answer three questions. First and most naturally, what causes over-lending? One may summarize three main sources in developing countries: (i) corruptive government (e.g., see

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businesses, and R&D investment projects for developing new technologies.

empirical documentation by Fishman, 2001, for the case concerning the political connection with President Suharto in Indonesia), (ii) weak corporate governance with expropriation by managers (e.g., see alleged incidents provided by Johnson et al, 2001, for the cases of the Sinar Mas Group in Indonesia, the Hyundai Group in Korea and the Bangkok Bank of Commerce in Thailand), and (iii) financial collusion between borrowing firms and loan decision-makers, which is the focus of the present paper.

The second question to raise is why over-lending has not been noticeably harmful for the Korean macroeconomy prior to the crisis. Although the problem was expedited by the liberalization of the capital account when financial institutions and firms were allowed to borrow abroad, excessive investments had co-existed with Korea's good economic performance for a long time and may thus likely be a feature of equilibrium outcome in Korea. Our paper will attempt to explain the emergency of this type of equilibrium based on economic primitives. Finally, the third question is: before over-lending becomes a serious problem as the economy deteriorates, why has this not been fixed over such a prolonged period of time? After all, the deterioration we saw in the case of Korea is not a sudden, but a gradual one. This surely demands for further explanations.

Can the theory developed in this paper shed light on identifying probable causes of the 1997 Korean financial crisis and addressing the three questions raised above? In particular, we inquire (i) whether financial crisis happened in Korea in the late 90s is possibly a result of transition from collusion to no-collusion equilibria and (ii) should this be possible, which parameter shifts are more likely to be the underlying driving forces. Concerning the second question, a decrease in π or α in theory would be the sources, but is implausible in practice as one would not expect the fraction of diligent entrepreneurs or the fraction of honest auditors to drop suddenly. If we use the interest rate of government bonds as a proxy of returns on the riskless project (B), it actually went down which suggests the collusion equilibrium becomes more stable according to our model. A possible candidate is a decrease in p. If the quality of investment opportunities deteriorates, the initial collusion equilibrium may then become unsustainable.

Our results suggest that under some circumstances, financial collusion between a low-type entrepreneur and a dishonest auditor may exist. It may be worth noting that in many developing countries, a primary reason for banks to fund lower quality investment projects is due to government's encouragement, either in forms of undisciplined protections of banks with high default rates or political lobbying in the interest of less-able entrepreneurs. With over-lending, an active liquidity management to restructure the financial sector may be harmful for short-run macroeconomic performance, as illustrated by the cases of Korea during the Asian financial turmoil.

VI. Concluding Remarks

What caused the 1997 financial crisis in Korea? In this paper, we argue that the over-investment problem caused by financial collusion is a major driving force of such a financial turmoil. How does this problem cause a widely spread financial crisis to arise suddenly? The underlying theme is still the self-fulfilling-crises story. To make this story work, however, there must be some gradual and anticipated changes in fundamentals in conjunction with a sudden shift in economic primitives. Our theoretical model delineates a plausible tale.

To be more specific, banks choose not to deter the collusion between low-type borrowing firms and loan-performance proctors when the economic environment is good. When the economic environment deteriorates in such a way that all agents observe, collusion equilibrium becomes unsustainable and the new equilibrium outcome must feature no-collusion. The combination of such noticeable (gradual) deterioration in fundamentals and the expectations of a sudden equilibrium-shift together can trigger aggressive speculative attacks and passive withdrawals of investments from Korea even before the actual equilibrium-shift takes place.

We would like to point out that the model presented here can be applied to a more general economic environment. For example, a corruptive government officer can replace a dishonest auditor in the present paper. In many developing countries, liability management by banks is impeded by repeated government intervention. The collusion between a corruptive government officer and a low-type

entrepreneur may induce the same results obtained. Moreover, a model without considering the auditors, and dividing the banks into two players – say, bank owners and loan officers (or bank managers) – can lead to the same conclusion as long as the two players have different objectives. To be more specific, while the objective of a bank owner is maximizing profit, that of a bank loan officer may be maximizing expected income inclusive of bribes from borrowing entrepreneurs. Of course, in this environment one may allow the bank owner demote or dismiss the loan officer when the realized output reveals the presence of false assessment of borrowers' types. In this case, one should no longer restrict the transfer payment (t) be nonnegative (i.e., a negative value of t indicates the cost of demotion/layoff). Such a punishment may serve as an additional mechanism to reduce the likelihood of financial collusion, though the basic arguments concerning collusion and no-collusion equilibrium remain valid.

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Table 1. Pre-Crises Financial Performance and Manufacturing Financing in Korea

Major Financial Indicators	%
Growth Rate of Total Loans to GDP Ratio by *International Financial Statistics* (1990-96)	17
Non-performing Loan Percentage (1996)	16
Foreign Debt to GDP Ratio by *World Development Report* (1990-96)	13-18
Short-Term Liabilities to Total Liabilities Ratio (End of 1996)	67
Short-Term Liabilities to Foreign Reserve Ratio (End of 1996)	213
Internal Financing Ratio for Large Enterprises with 300 or More Employees (1997)	21.8
Internal Financing Ratio for Small/Medium Enterprises (1997)	33.6
Debt-Equity Ratio (1997)	396.3

Sources: Computed using data from the Bank of International Settlement (BIS), unless otherwise noted.
Note: Based on *Financial Statement Analysis for 1997* (by Bank of Korea, 1998), the Internal Financing Ratios in Japan (1996), Taiwan (1995) and the U.S. (1996) were 34.1, 53.9 and 39.4, respectively, whereas the Debt-Equity Ratios in the respective countries were 193.2, 85.7 and 153.5.

Table 2. External Liabilities of Financial Institutions and Corporations in Korea (in billions US$)

	1992	1993	1994	1995	1996	1997	1998
Total External Liabilities	62.9	67.0	88.7	119.7	164.3	158.1	149.4
1. Financial Institutions's Liabilities	43.6	47.5	65.1	90.5	116.5	89.6	71.9
2. Corporations' Liabilities	13.7	15.6	15.6	26.1	41.8	46.2	41.0
3. Public Sector's Liabilities	5.6	3.9	8.0	3.1	6.0	22.3	36.5

Source: Data from the Ministry of Finance and Economy, Korea.
Note: "External Liabilities" include external debts, off-shore borrowing of Korean banks, and borrowing in foreign currency of Korean banks' overseas branches.

Table 3. Trends in Market Share of Non-Bank Financial Institutions in Korea (in %)

	1980	1985	1990	1995	1998
Deposits	29.1	46.4	59.0	72.2	72.2
Loans and Discounts	36.7	41.6	51.7	63.5	62.1

Source: Bank of Korea.
Notes: As of the end of June 1999, Non-Bank Financial Institutions operated businesses of five types: (i) development (Korean Development Bank and Export-Import Bank of Korea), savings (Trust Accounts of Banks, Mutual Savings and Financial Companies, Credit Unions, Mutual Credit Facilities, Community Credit Cooperatives, and Postal Savings), (iii) investment (Merchant Banking Corporations, Securities Investment Trust Companies, and Korea Securities Finance Corporation), (iv) insurance (Life Insurance Companies and Postal Life Insurance), and (v) other financial institutions (Securities Companies, Investment Advisory Companies, Credit Guarantee Funds, Non-Life Insurance Companies, Leasing Companies, Venture Capital Companies, and Installment Credit Companies).

Table 4. Financial Situations of Top 30 *Chaebols* in Korea at the End of 1996 (in trillions won)

	Chaebol	Assets	Debts	Sales	Net Profit	Debt/Equity Ratio (%)
1	Hyundai	53.18	43.32	68.01	.18	439
2	Samsung	50.86	37.04	60.11	.18	268
3	LG	37.07	28.77	46.67	.36	347
4	Daewoo	34.21	26.38	38.25	.36	337
5	Sunkyong	22.73	18.04	26.61	.29	385
6	Ssangyong	15.81	12.70	19.45	-.10	409
7	Kia	14.16	11.89	12.10	-.13	524
8	Hanjin	13.90	11.79	8.70	-.19	557
9	Hanhwa	10.97	9.72	9.69	-.18	778
10	Lotte	7.75	5.10	7.19	.05	191
11	Kumho	7.40	6.12	4.44	-.02	478
12	Halla	6.63	6.32	5.29	.02	2068
13	Doosan	6.40	5.59	4.05	-.11	692
14	Donga Construction	6.29	4.91	3.89	.04	355
15	Daelim	5.79	4.59	4.83	.01	380
16	Hansol	4.79	3.71	2.55	-.01	343
17	Hyosung	4.12	3.25	5.48	.04	373
18	Jinro	3.94	3.90	1.48	-.16	8599
19	Kolon	3.80	2.89	4.13	.02	317
20	Dongguk Jaekang	3.70	2.54	3.07	.09	210
21	Kohap	3.65	3.12	2.52	.03	590
22	Haitai	3.40	2.95	2.72	.04	658
23	New Core	2.80	2.59	1.83	.02	1224
24	Anam Industrial	2.64	2.18	1.98	.01	478
25	Hanil	2.63	2.23	1.30	-.12	563
26	Sammi	2.52	2.59	1.49	-.25	3245
27	Sinho Jaeji	2.13	1.71	1.22	-.01	490
28	Bongil	2.03	1.83	0.87	-.09	921
29	Dongguk Muyok	1.62	1.36	1.07	-.02	588
30	Hansin Kongyong	1.33	1.15	1.06	.00	649

Source: Chosun Ilbo, November 27, 1997.
Notes: The ordering is based on Total Assets. After Asian financial crisis occurred, [4] Daewoo, [6] Ssangyong, [7] Kia, [12] Halla, [14] Donga Construction, [18] Jinro, [20] Dongguk Jaekang, [22] Haitai, [23] New Core, [26] Sammi, [27] Sinho Jaeji, and [30] Hansin Kongyong had been bankrupted or in the insolvency state by the end of 1999.

Table 5. Composition of Loans in the Export-Import Bank of Korea (in billion won and %)

Chaebol	1991	1992	1993	1994	1995	1996	1997	1998
Total Loans	1,284.8	1,294.6	2,340.6	3,031.5	4,178.5	5,022.5	7,540.2	6,724.6
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Hyundai	282.8	263.9	308.9	431.0	633.8	891.9	1,737.7	1,956.6
	(22.0)	(20.4)	(13.2)	(14.2)	(15.2)	(17.8)	(23.1)	(29.1)
Samsung	68.4	113.9	741.1	1,066.6	1,040.0	636.5	991.0	629.4
	(5.3)	(8.8)	(31.7)	(33.2)	(24.9)	(12.7)	(13.1)	(9.4)
Daewoo	369.9	283.2	353.3	353.3	506.2	915.2	738.7	1,138.0
	(28.3)	(21.9)	(15.1)	(11.7)	(12.1)	(18.2)	(9.8)	(16.9)
LG	14.7	32.0	324.6	426.4	571.5	446.6	484.9	298.2
	(1.2)	(2.5)	(13.9)	(14.1)	(13.7)	(8.9)	(6.4)	(4.4)
Sunkyung	—	—	—	—	76.0	43.9	40.5	—
	—	—	—	—	(1.8)	(0.9)	(0.5)	—
Kia	—	—	—	—	27.1	122.5	116.9	162.4
	—	—	—	—	(0.7)	(2.4)	(1.6)	(2.4)
Kumho	—	3.6	4.0	2.3	8.5	14.5	19.1	34.3
	—	(0.3)	(0.2)	(0.1)	(0.2)	(0.3)	(0.3)	(0.5)
Daelim	—	18.3	174.6	166.9	96.6	228.8	419.3	203.6
	—	(1.4)	(7.5)	(5.5)	(2.3)	(4.6)	(5.6)	(3.0)
Halla	4.7	14.1	5.9	32.5	91.8	144.8	228.4	4.5
	(0.4)	(1.1)	(0.3)	(1.1)	(2.2)	(2.9)	(3.0)	(0.1)
Kolon	3.0	—	—	—	1.0	5.8	58.9	44.2
	(0.2)	—	—	—	(0.02)	(0.1)	(0.8)	(0.7)
Dongguk Jaekang	—	—	—	2.7	7.7	3.5	28.9	22.4
	—	—	—	(0.1)	(0.2)	(0.1)	(0.4)	(0.3)
Hanil	0.4	7.0	2.4	—	—	—	—	—
	(0.03)	(0.5)	(0.1)	—	—	—	—	—
Hanjin	—	7.0	45.5	15.3	17.9	—	—	—
	—	(0.5)	(1.9)	(0.5)	(0.4)	—	—	—
Poongsan	—	—	—	24.5	23.5	38.5	43.6	6.3
	—	—	—	(0.8)	(0.6)	(0.8)	(0.6)	(0.1)
Hankuk Tire	—	4.3	3.4	4.7	—	15.1	39.2	45.7
	—	(0.3)	(0.1)	(0.2)	—	(0.3)	(0.5)	(0.7)
SKC	—	—	—	—	—	—	—	333.5
	—	—	—	—	—	—	—	(5.0)
Hnakuk Heavy Ind.	7.1	7.4	48.7	169.2	296.9	156.5	250.2	112.9
	(0.6)	(0.6)	(2.1)	(5.6)	(7.1)	(3.1)	(3.3)	(1.7)
Korean Electricity	114.7	117.6	137.4	130.1	77.5	59.1	30.9	34.0
	(8.9)	(9.1)	(5.9)	(4.3)	(1.9)	(1.2)	(0.4)	(0.5)
Other *Chaebol*	422.4	422.3	190.8	266.5	702.5	1,299	2,310	1,698.6
	(32.9)	(32.6)	(8.2)	(8.8)	(16.8)	(25.9)	(30.6)	(25.3)

Source: Export-Import Bank of Korea.

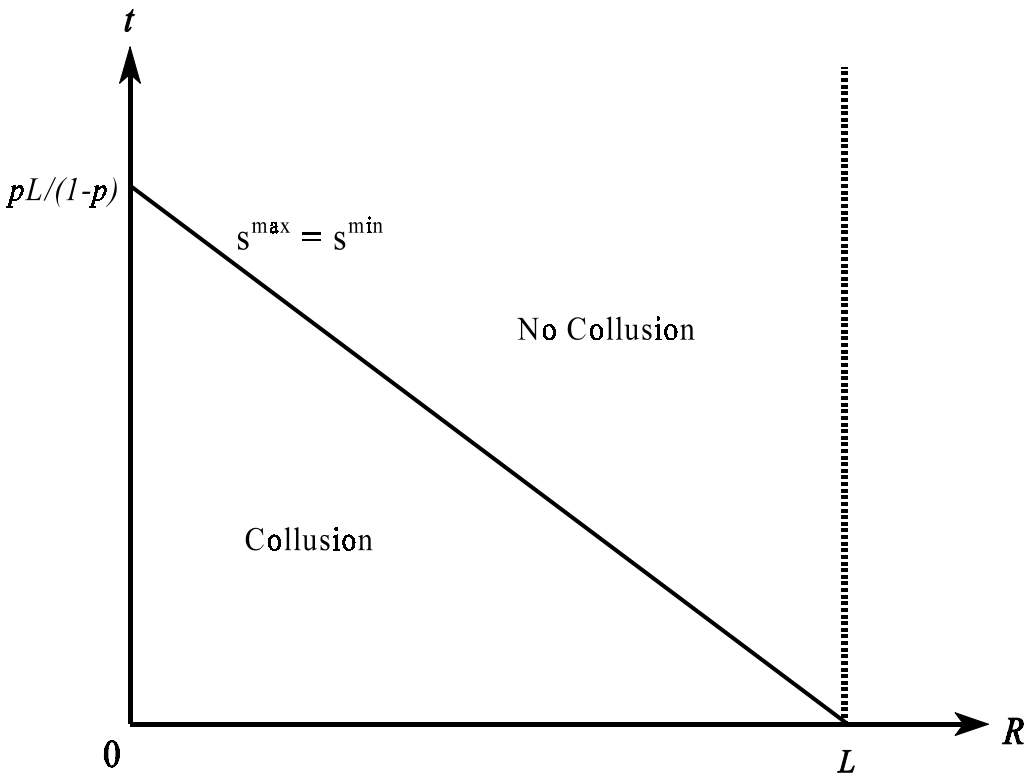


Figure 1: Whether a (*R*,*t*) pair leaves room for bribery

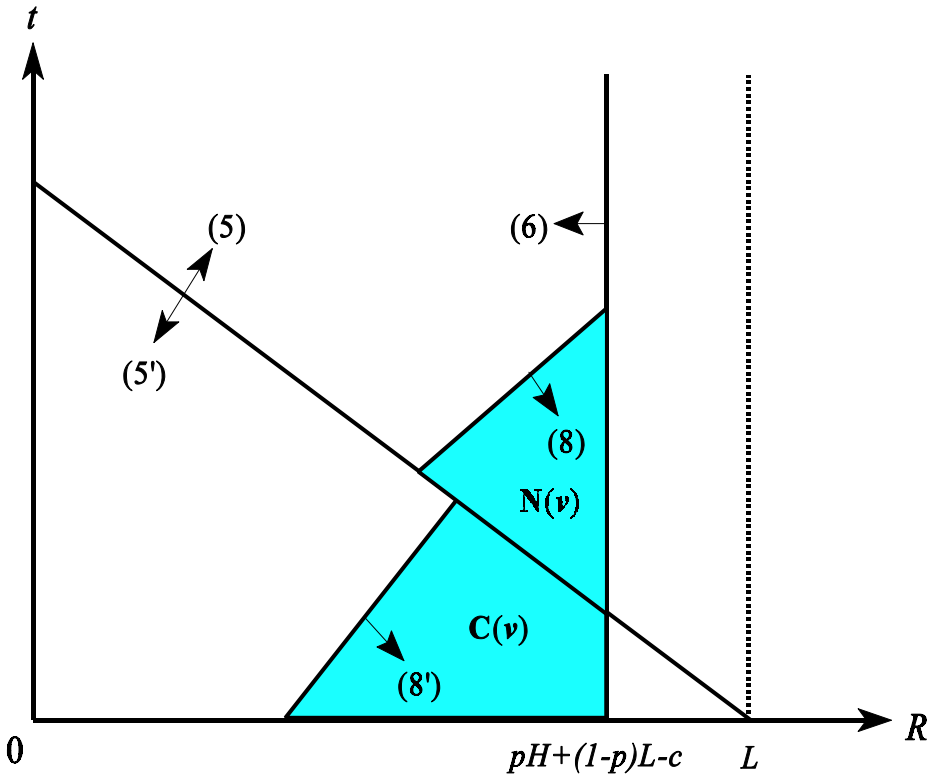


Figure 2: Collusion set and no-collusion set

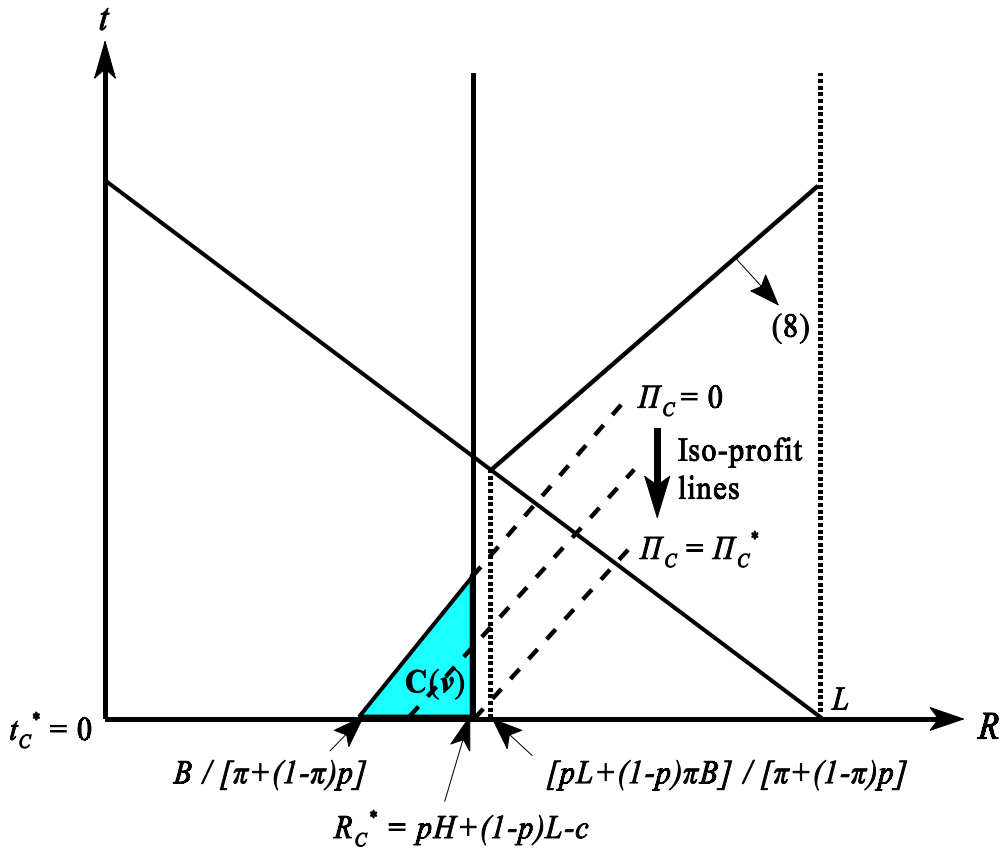


Figure 3: Banks' optimal decisions when set N(v) is empty

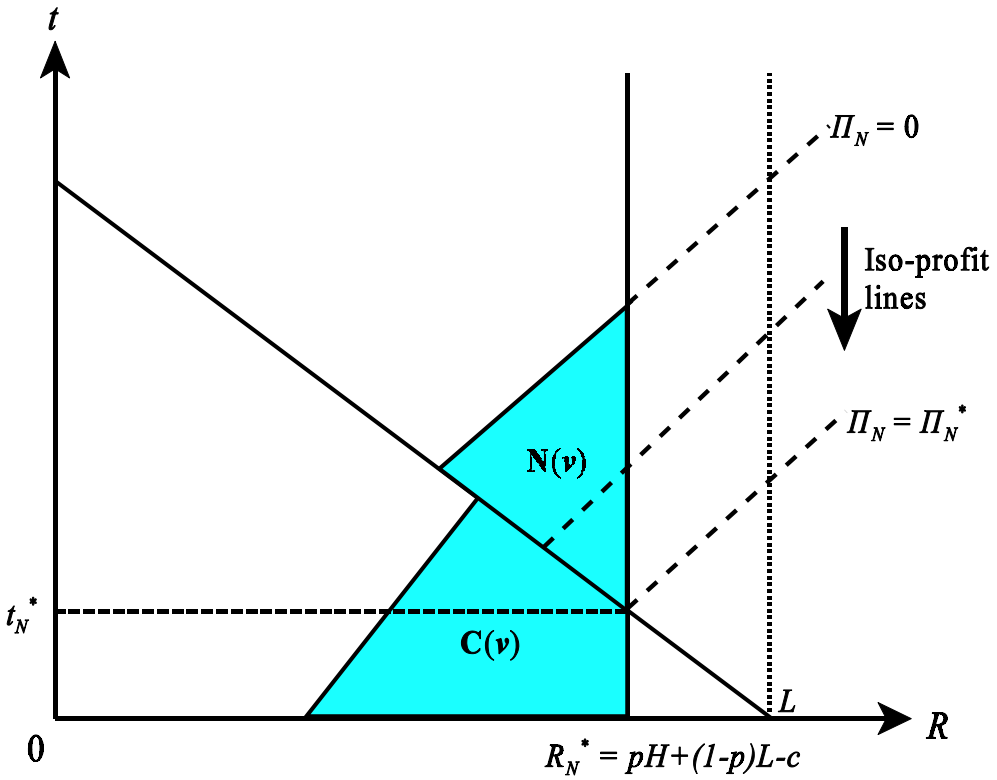


Figure 4: Banks' optimal decisions under no-collusion

Figure 5. Major Macroeconomic Indicators in Korea (1991-2000, all in %)

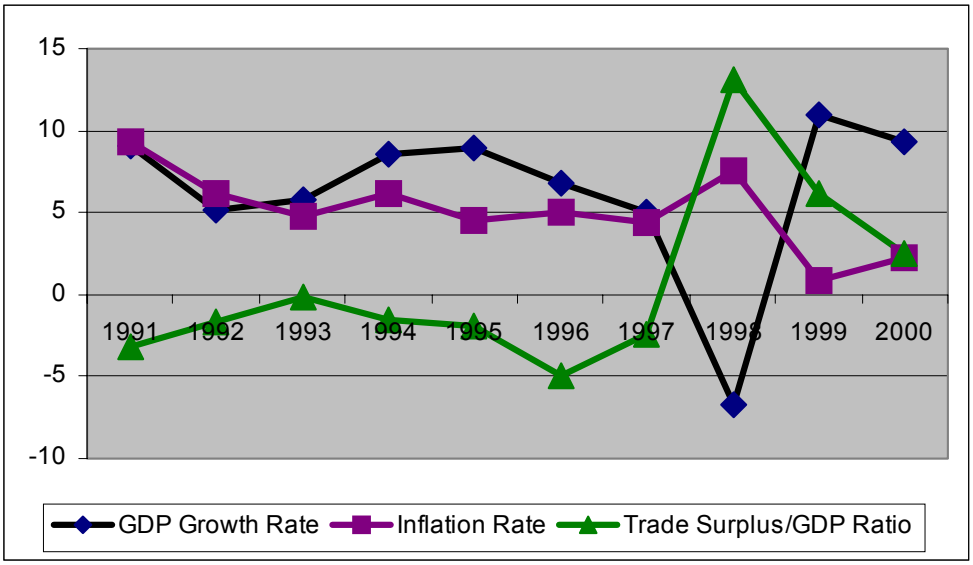


Figure 6. Exchange Rate (won per U.S. dollar)

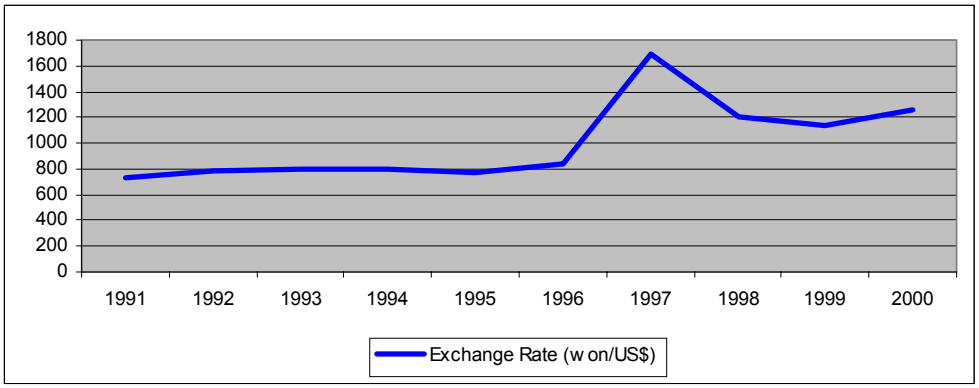
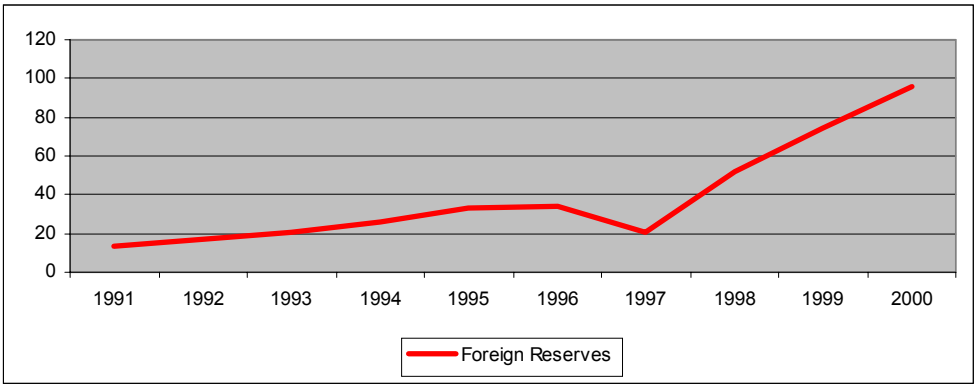


Figure 7. Foreign Reserves (in billions US dollar)



Appendix

In this appendix, we provide an overview of the 1997 Asian financial crisis. By undertaking a comparative study, we wish to gain further insights towards understanding the nature of the underlying driving forces of the Korean financial crisis.

Table A1 describes pre-crises macroeconomic performance in three Asian economies experiencing severe financial crises (Indonesia, Korea Republic, and Thailand), contrasting with three experiencing either moderate crisis or no crisis (Hong Kong, Singapore, and Taiwan).[1] From 1990 to 1996, all had long-lasting growth exceeding 5%, moderate inflation generally under 10%, savings rates higher than 25%, with government budget surpluses (except Korea which had moderate deficits) and with either trade surpluses or moderate deficits less than 5% of GDP (except Thailand). Except Korea, all held reserves at least as large as three months of imports. While Korea is the only economy with noticeable exchange rate depreciation prior to 1997 (9%), Korea and Thailand were the only two experiencing significant drops in stock prices in 1996 (26 and 35%, respectively). Thus, the macroeconomic performance of these Asian economies prior to the crises seemed reasonably healthy.[2] Yet, the arrival of the crises was sudden and widely spread.[3] In particular, (i) the drops in stock prices in Indonesia, Korea and Thailand (from the end of 1996 to the end of 1997) were from 37 to 55%, whereas those in Hong Kong and Singapore were 20 and 30%, respectively (although the Taiwanese stock market continued to burst, but at a slower pace, 18 versus 24%, compared to a year before); and, (ii) the rates of depreciation of local currencies to the US dollar for Indonesian rupiah, Korean won and Thai baht were from 84 to 236% and the depreciation rate of new Taiwan dollar was about 19%.[4]

Table A2 further examines the financial performance of these economies prior to the 1997 crises. Using the growth rates of the total loans to GDP ratios over 1990-96 to measure the degrees of lending boom, we find that all but Taiwan exceeded 10%, with Korea reaching 17% and Thailand 51%. It is also clear that all economies suffered severe financial crises had (i) much higher non-performing loan percentage in 1996 (ranging from 16 to 19%, compared to 4% in Hong Kong, Singapore and Taiwan), and (ii) relatively higher foreign debt to GDP ratio during the period of 1990-96 (from 13-18% in Korea to 53-70% in Indonesia, compared to less than 0.1% in Singapore and Taiwan). Moreover, the moderate figures of the short-term liabilities (towards the BIS) to total liabilities ratios indicate that illiquidity seemed not a major cause of the Asian financial crises.

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[1] By Barro's criteria (2001), Indonesia, Korea and Thailand all have experienced a crisis in 1997 as their nominal currency depreciation exceeded 25% in at least a quarter of this year with that depreciation rate exceeding the comparable figure in the previous quarter by a margin of at least 10%.

[2] Even by using long-term data over the past two decades, all economies have experienced sustained growth at rates exceeding 5%: the rates of GDP growth for Hong Kong, Indonesia, Korea, Singapore, Taiwan, and Thailand over the period 1977-97 were 6.6, 6.2, 7.2, 7.2, 7.6, and 7.1%, respectively.

[3] Since several countries in East Asia had a financial crisis during a short time span, financial contagion is largely believed, though there lacks a formal theory particularly suitable for this incidence (for a general theory of contagion, see Allen and Gale, 2000, and Diamond and Rajan, 2001).

[4] Similar patterns also held using the real exchange rate data constructed by J.P. Morgan. Notably, Hong Kong had a currency board tied with US dollar, whereas the Singaporean exchange rate market was heavily controlled then. Thus, there were little movements in their exchange rates.

Table A1. Pre-Crises Macroeconomic Performance in Selected Asian Economies

	Hong Kong	Singapore	Taiwan	Indonesia	Korea	Thailand
GDP Growth (%)						
1990-91	4.97	7.27	7.60	6.95	9.13	8.41
1994-95	4.40	8.75	6.40	8.22	8.94	8.68
1995-96	5.00	7.32	6.10	7.98	6.80	6.66
Inflation						
1990-91	11.60	3.40	3.60	9.40	9.30	5.70
1994-95	8.59	1.79	3.70	9.43	4.49	5.69
1995-96	5.98	1.32	3.10	8.03	4.96	5.85
Savings/GDP						
1990	35.9	45.3	29.3	31.8	35.7	32.3
1995	31.6	51.1	27.0	27.7	35.1	37.6
1996	32.0	51.3	26.7	28.7	33.3	33.6
Fiscal Surplus/GDP						
1990	--	10.53	7.96	0.43	-0.68	4.59
1995	--	14.27	2.72	2.29	0.30	3.01
1996	--	12.13	2.14	1.19	-0.07	4.13
Trade Surplus/GDP						
1990	8.40	9.45	4.85	-4.40	-1.24	-8.74
1995	-2.21	17.93	1.64	-4.25	-1.91	-9.00
1996	0.58	16.26	3.33	-3.41	-4.89	-9.18
Reserves in billions US$ (months of imports)						
1990	39 (3.1)	29 (5.4)	72 (13.0)	7 (3.2)	15 (2.3)	13 (4.5)
1995	62 (3.1)	69 (6.8)	90 (9.1)	14 (2.9)	33 (2.5)	36 (5.4)
1996	64 (3.5)	77 (7.0)	88 (8.6)	18 (3.6)	34 (2.3)	38 (5.4)
1997	93 (4.9)	71 (7.1)	84 (8.6)	17 (3.8)	20 (1.5)	26 (4.1)
Stock Index						
1990	3024	1154	4350	417	696	612
1995	10073	2266	5158	513	882	1280
1996	13451	2216	6933	637	651	831
1997	10722	1529	8187	401	376	372
Exchange Rate/US$ (real exchange rate)						
1990	7.79 (100)	1.81 (100)	27.1 (--)	1843(100)	708 (100)	25.6(100)
1995	7.73 (86)	1.42 (89)	27.3 (--)	2249(96)	775 (109)	24.9(100)
1996	7.74 (79)	1.41 (86)	27.5 (--)	2383(92)	844 (110)	25.6(94)
1997	7.75 (78)	1.40 (85)	32.6 (--)	8025(156)	1695 (163)	47.2(142)

Sources: Computed using data from various issues of *International Financial Statistics* (IFS, by IMF), *Taiwan Statistical Data Book* (TSDB, by Council for Economic Planning and Development of ROC), *World Development Report* (WDR, by World Bank), and *World Economic Outlook* (WEO, by IMF), except the real exchange rate which is the inverse of the J.P. Morgan index using 1990 as the base year.

Table A2. Pre-Crises Financial Performance in Selected Asian Economies (all in %)

	Hong Kong	Singapore	Taiwan	Indonesia	Korea	Thailand
Growth Rate of Total Loans to GDP Ratio by IFS/TSDB (1990-96)	14	16	7	12	17	51
Non-performing Loan Percentage by BIS (1996)	4	4	4	17	16	19
Foreign Debt to GDP Ratio by TSDB/WDR (1990-96)	--	0.004-0.09	0.02-0.07	53-70	13-18	33-40
Short-Term Liabilities to Total Liabilities Ratio (End of 1996)	82	92	84	61	67	65
Short-Term Liabilities to Foreign Reserve Ratio (End of 1996)	--	--	--	181	213	169

Sources: Computed using data from the Bank of International Settlement (BIS), unless otherwise noted.