Relationship Banking in Bilateral Oligopoly and Asymmetric Information*

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Abstract

This paper investigates the economic principles underlying the relationship between the real sector (*non-financial*) and the banking sector structures. Most literature has so far focused on the structure of conglomerates (*Keiretsu/Chaebol*) in East Asia in explaining the fast economic growth and/or recent crisis in the region. Traditionally, the strong vertical relationship between core companies and their subsidiaries in the real sector was believed to be a driving force for the economic success in the region. However, the degree of vertical relationship varies depending upon macroeconomic fluctuations and subsequently affects their relationship banks. The paper analyses the information sharing in a bilateral oligopoly framework. When banks prefer strong collaterals and/or credible third party repayment guarantees, a weaker vertical relationship in the real sector should lead to a consolidation in the banking sector via mergers or exits. Empirical evidence from the panel data constructed for the top 10 Chaebols and their subsidiaries between 1994-2002 supports the argument.

JEL Classification: G21, G28, L13, L59
Key words: Relationship banking, bilateral oligopoly, vertical relation, asymmetric information.

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1. Introduction

This paper develops a stylised model for banking structure where banks provide loans to borrowers (*firms*) with heterogeneous vertical relationships. Asymmetric information between lenders and borrowers commonly creates problems of adverse selection and moral hazard as *ex ante* screening in approving loans and *ex post* monitoring of outstanding loans become costly for lenders. Thus, one of the main banking roles is to reduce the information cost for financial intermediation (Diamond, 1991; Boot, 2000) and relationship banking has been one way to resolve the problems of asymmetric information alongside credit rationing (Stiglitz and Weiss, 1981) [1]. In doing so, relationship banking commonly aims at the accumulation of soft information over time (Berger and Udell, 2002)[2]. When dealing with small firms which are vulnerable with less transparent information, the information gap between insiders and outsiders become larger and relationship banking can play an important role in narrowing this gap.

In this context, I argue that a strong vertical relationship among borrowers, in particular, between a holding company and its subsidiaries, can mitigate these incentive problems by reducing information cost with delegated monitoring via holding companies (Cerasi and Daltung, 2003). Moreover, risk diversification tied to a holding company is key to the model as the borrower's risk diversification can moderate banks' exposure to non-performing loans (Diamond, 1984). Collaterals or guarantees by diversified holding companies are usually considered to be credit-worthier than those provided by their subsidiaries as diversified investment portfolios of holding companies allow lower risk to lenders (*banks*).

The strong vertical relationship between holding companies and their subsidiaries in the real sector (*non-financial*) was believed to be a driving force for the economic success in East Asia. Hence, most literature has so far focused on the structure of conglomerates (*Keiretsu/Chaebol*) to identify the engine for growth. However, the degree of vertical relationship can vary depending upon macroeconomic fluctuations and subsequently may

[1] Relationship banking is defined as successive long-term contracts between firms and banks in this paper. In addition, when borrowers have a vertical relationship, relationship banking implies banking with the same principal bank of the respective holding company.
[2] Soft information is not usually verifiable and relies on a credit officer's subjective judgement whilst hard information is based on a more verifiable evidence such as firm's balance sheets, income statements, and so on.

affect their relationship banks. In particular, I argue that the information sharing structure (*asymmetric*) among 1/ holding companies (*Chaebol*), 2/ their subsidiaries[3], and 3/ their relationship banks influences the banking industry structure. Bank failures during economic downturns seemed to arise because banks are not always in a position to obtain full information about respective borrowers. Complexity may relate to the competitiveness of the subsidiaries, of which holding companies may have superior knowledge to that of the relationship banks.

In the aftermath of the recent financial crisis in Asia, there has been a substantial consolidation of the banking sector (see Table 1 and Figure 1) whereas the real sector has undergone a significant spin-off process by cutting down cross-holdings between holding companies and subsidiaries. As Villas-Boas and Schmidt-Mohr (1999) claimed, more competition may lead to more screening under asymmetric information because banks compete more intensely for the most profitable and creditworthy customers that are now scarcer.

On the other hand, there has been a plethora of literature which tried to analyse the impact of technological innovations, regulatory regime shifts, and monetary policy shocks on banking industry consolidation. However, I argue that the banking industry consolidation cannot be fully explained by exogenous shocks in the financial sector without investigating endogenous changes influenced by the real sector, especially via changes in vertical relationship between firms. In firm-bank specific relationships, we may consider firms as buyers (*borrowers*) of loan products at certain prices (*loan rates*). As per what determines bargaining positions of firms and/or banks regarding loan products, vertical mergers are considered to be one way for firms to enhance their market power whilst horizontal mergers are a common solution for banks. Another important point is that welfare can be improved by strong buyers (*borrowers*) who may force their suppliers (*banks*) to reduce prices (*loan rates*) as Galbraith (1954) suggests.

The novelty of the paper lies in linking the structure of the real sector and the banking structure. In particular, the main aim is to link the vertical relationship structure of the real sector and the horizontal structure of the banking sector. There are advantages and

[3] These subsidiaries are not necessarily small and medium size enterprises (SMEs) although they are usually smaller in asset size terms compared to their respective holding companies.

disadvantages of relationship banking using asymmetric information in a bilateral oligopoly framework. Firms may have incentives or disincentives to disclose information to the banks for the approval of their loans. This may depend on a firm's true state of business. When subsidiary firms do not have an incentive to disclose information, their vertical relationship with holding companies can provide information indirectly i.e. delegated monitoring for banks. This fits into the framework of bilateral and successive oligopoly structure between firms and banks when they favour countervailing market power (Waterson 1984; Salinger 1988; Abiru et al. 1998).

The paper is organised as follows. The basic model is outlined and discussed in Section 2. The econometric specification is presented in Section 3. Section 4 discusses the empirical results and applies the analysis of section 2. Section 5 concludes the paper.

2. Model

In this paper, banks are considered to produce loan products by taking deposits as funding sources. Deposits might appear as one of the products that banks offer but the role of deposits in the banking operation lies in the cost function. Since the interest rates are determined not entirely by market competition[4], it is worth being cautious in using interest rates as a proxy for the price variable in banking. The model consists of lenders (*banks*) and borrowers (*firms*). Money market activities are allowed in the model but government intervention is not allowed.

The usual assumptions for Salop's model adopted in Chiappori et al. (1995) are applied. However, I depart from Chiappori's model in three respects: 1/ asymmetric information between the lender and the borrower i.e. imperfect information on the lender's side regarding the quality of the project, 2/ loss related to non-performing loans, and finally 3/ the introduction of vertical relationship among borrowers.

There are N banks located on the circle and each installation costs fixed cost C. Banks are identical and can freely enter or exit. Each bank needs depositors to finance the bank's funding as well as borrowers. A continuum of customers, both borrowers and depositors, is

[4] Monetary policy can affect the benchmark inter-bank rates and therefore can shift the overall level of deposit and loan rates.

assumed to be uniformly located around a unit circle with a unit density in an economy. For simplicity, each customer on the circle has one unit of cash that must necessarily be deposited in a bank. The typical bank will pay an interest *t*. The depositors are supposed to incur a transportation cost α per unit length.

Each bank can make loans to customers using the collected funds from depositors. The lending rate is *r* and β is the unit transportation cost that borrowers have to incur. Inequality is allowed in the respective price elasticities of loans and deposits, i.e. α and β are not necessarily the same. The transportation costs α and β include costs incurred to gather relevant information of banking services.

A fraction γ of the total population is supposed to borrow and these borrowers are uniformly distributed around the unit circle. A crucial assumption here is that borrowers are also depositors. The size of each loan is L and the surplus generated by loan is supposed to be large enough to justify borrowing at the prevailing rate. The prevailing technology is assumed to be linear. The money market rate ρ is exogenously set by monetary authorities and works as a benchmark rate for the market that banks may mark up and/or down against[5]. Aggregate net demand of the banking sector on the money market is equal to $\gamma L - 1$ considering a unit circle of deposits. If aggregate net demand on the money market is zero, the total volume of loans made by banks is equal to the total volume of deposits, $V = \gamma L = 1$

The degree of vertical relationship among borrowers is parameterised by λ, which can be interpreted in terms of the duration length of the vertical relationship and/or the vertical ownership structure. The parameter λ varies between $0 \le \lambda \le 1$ where $\lambda = 0$ is for complete integration whereby the holding company takes the full responsibility for the subsidiary's repayment of the loans either by sufficient collaterals or 3rd party repayment guarantee. On the other hand, $\lambda = 1$ indicates no vertical relationship where the banks need to assess the risk of a project independently from that of any other companies. In practice, the case where $\lambda = 1$ means that the firm is independent and does not belong to any holding companies.

[5] The parameter ρ is considered to be a weighted average of non-banking rates which include any exogenously set rates such as the money market rate, the rate on government bonds and etc.

It is important to note that each bank has a proportion ϕ of the total loans in non-performing loans (*NPLs*), on which the banks have to build provisions. Using the provision rate δ on NPLs, the loss function related to NPLs becomes $(\delta + r)\phi$ of loans including the loss on interest repayment. The degree of vertical relationship transforms this loss function into $(\delta + r) \cdot \lambda\phi$ as full repayment guarantees and collaterals provided by holding companies moderate the provisions on non-performing loans.

The objective function of profit maximisation was derived based on the Klein-Monti approach[6]. The objective function takes interest rates (*price*) as a strategic variable for competition when banks are assumed to maximise their profits by choosing the parameters and the strategic variable of interest rate. Equilibrium numbers of banks (*N*) are derived.

The notation is as follows. Superscript *S* was used for short-term values obtained for a given number of N banks. Superscript *L* refers to long-term values when the number of banks (*N*) is endogenised.

Banks enter the market when profits cover their fixed cost of entry. A typical customer will search between bank i and i^0 and the marginal depositor condition (*x* distance away from the bank) for the bank is :

$$\alpha x - t_i = \alpha\left(\frac{1}{n} - x\right) - t^0 \tag{1}$$

Hence, the supply of deposits for the bank is:

$$2x = \frac{1}{n} + \frac{t_i - t^0}{\alpha} \tag{2}$$

Equivalently, the marginal borrower condition (*y* distance away from the bank) for the bank is:

[6] Klein and Monti consider a monopolistic competition.

$$\beta y + r_i L = \beta\left(\frac{1}{n} - y\right) + r^0 L \tag{3}$$

Hence, the total volume of demand for loans for the bank is:

$$2y \cdot V = \left(\frac{1}{n} - \frac{r_i - r^0}{\beta} \cdot L\right) \cdot V \tag{4}$$

Non-performing loans (*NPLs*) enter the loss function and thus affect the profit function (π_i) in the model. However, it is important to note that these non-performing loans are not going to affect the entry decision of banks *ex ante* since they are *ex post* loss provisions. Assume a proportion ϕ of the total loans are non-performing loans (*NPLs*), on which the banks have to build provisions of $(\delta + r)\phi$ proportion on loans at a provision rate δ[7]. Then, the profit function of bank i becomes

$$\pi_i = (r_i - \rho)\left(\frac{V}{n} - \frac{r_i - r^0}{\beta} VL\right) + (\rho - t_i)\left(\frac{1}{n} + \frac{t_i - t^0}{\alpha}\right) - C - (\delta + r_i) \cdot \lambda\phi \cdot \left(\frac{V}{n} - \frac{r_i - r^0}{\beta} VL\right) \tag{5}$$

where $\lambda = 1$ if no vertical relationship
$\lambda = 0$ if maximum vertical relationship
(e.g. full repayment guarantee by a holding company)

Differentiating the profit function with respect to t_i and r_i and applying symmetry by substituting to $t_i = t^0$ and $r_i = r^0$ into the first-order conditions leads to the following symmetric equilibrium condition:

At the symmetric equilibrium, short-term rates are given by:

$$t^s = \rho - \frac{\alpha}{n} \tag{6}$$

[7] Assume $0 < \delta < 1,\ 0 < \phi < 1$ as neither provisions nor NPLs can be larger than the total volume of loans.

$$r^s = \frac{\rho}{1-\lambda\phi} + \frac{\lambda\phi}{1-\lambda\phi} \cdot \delta + \frac{1}{n} \cdot \frac{\beta}{L} \tag{7}$$

In the short run, deposit rates are mainly driven by the prevailing money market rate ρ and higher transportation cost α, which can be interpreted as the information search cost for depositors, work favourably for banks since it provides a certain degree of geographical market power. However, as more banks enter the market ($n \uparrow$), tougher competition for deposits may force the banks to offer higher deposit rates and raise their funding costs.

On the other hand, short-term loan rates are positively associated with the size of non-performing loans and negatively associated with the degree of vertical relationship of borrowers. These are arguably due to the risk-adverse nature of banking business. Provision rates are also positively related to loan rates. When borrowers incur high transportation costs, i.e. higher information search cost, a typical bank can charge higher loan rates. The same logic of geographical market power applies here and this market power gets mitigated as more banks enter the market ($n \uparrow$).

However, the prevailing money market rate ρ still remains as a benchmark rate for both deposit rates and loan rates whilst the fixed cost of bank's entry (C) does not affect short-term rates.

Under the free-entry condition $(\pi = 0)$, the number of banks in the market n and the long-run equilibrium values for t^L and r^L are derived as follows:

$$n = \sqrt{\frac{\alpha + \beta(1-\lambda\phi)V/L}{C}} \tag{8}$$

$$t^L = \rho - \alpha\sqrt{\frac{C}{\alpha + \beta(1-\lambda\phi)V/L}} \tag{9}$$

$$r^L = \frac{\rho}{1-\lambda\phi} + \frac{\lambda\phi}{1-\lambda\phi}\delta + \frac{\beta}{L}\sqrt{\frac{C}{\alpha + \beta(1-\lambda\phi)V/L}} \tag{10}$$

As in the short-run equilibrium, the NPL ratio does not affect the deposit rates but affects the loan rates positively. The provision rate is also positively related to the loan rates. Higher loan rates can be interpreted as the banks' reaction towards risky assets to offset the potential loss in non-accrual interest payments and the loan provisions. On the other hand, a strong vertical relationship with a holding company, which can secure full repayment guarantees, reduces loans rates.

The deposit and loan rates are positively related to the money market rates. The mark-down and mark-up are not simple any more given the consideration of NPLs and vertical relationships among borrowers. The margin is positively related to the NPL ratio and negatively related to the degree of vertical relationship. It is important to note that any change in ρ due to some monetary policy will be passed on to rates offered by banks but the magnitude of impact on the loan rates is larger as the NPL ratio increases. Even if banks do not participate in the money market ($V = \gamma L = 1$), the money market rate ρ still remains as a dominant factor for the equilibrium rates offered by banks.

The endogenous number of banks in the long-run is positively related to the short-term profits since it creates more room for banks to enter the market. Hence, the NPL ratio is positively related to concentration in the banking structure. On the other hand, a stronger vertical relationship among borrowers makes the banking structure more fragmented. A large proportion of East Asian companies are established under some sort of vertical relationship with conglomerate holding companies. For instance, divestitures or exits of subsidiaries in the region in the aftermath of financial crisis and the economic slowdown were followed by a consolidation in the banking sector.

When the vertical relationship is strong among borrowers, banks have an incentive to delegate their monitoring through holding companies that have better knowledge of their subsidiaries business. In addition, these strong vertical relationships can be translated into the holding

companies commitment in 3rd party repayment guarantees (or collaterals)[8]. In the same context, firms have incentives to remain in their respective conglomerate groups since they can obtain loans at lower costs subject to holding companies' commitment on guarantee.

3. Empirical Model

A complementary econometric model is used to investigate the relationship banking patterns in Korea. Traditionally, firms in Korea tend to have long-term relationships with their respective banks. Usually, this relationship is dominated by the banking behaviour set by the holding companies. Good quality subsidiaries are expected to follow the principal banks appointed by their holding companies. This will support the stylised model presented in the previous section where a strong vertical relationship creates more profitable projects or profitable projects attracts more ownership interests from holding companies, hence it allows more banks to enter the market. Similarly, we assume a weaker vertical relationship is associated with poor performance and/or more risky projects born by subsidiaries. Therefore, these firms are more likely to need to find independent banks rather than to go along with the holding company's principal bank.

An immediate question to follow here is what happens to the banking structure when the vertical relationship among their borrowing companies changes. In this empirical analysis, I aim to explain why the banking sector in Korea has experienced such a dramatic consolidation by using changes in the vertical relationship in the real sector.

The most commonly used discrete choice probability model takes the following form:

$$P_{it} = \mathbf{Pr}\left(y_{it} = 1\right) = \mathbf{E}\left(\mathrm{y_{it}} \middle| X_{it}\right) = \mathbf{F}\left(X_{it}'\beta\right) \tag{11}$$

where $y_{it} = 1$ **if the relationship bank experienced M&A**

$y_{it} = 0$ **otherwise**

$i = 1,...,322 \qquad t = 1,...,9$

[8] One can argue that loans are asset specific in this case and apply a broader sense of firm boundary suggested by

The simplest structure ignoring the panel structure is:

Pooled Estimator: $y = X\beta + \varepsilon$ (12)

However, given the panel structure of the data, the following model will reduce the loss of information:

Random Effects Estimator: $y_{it} = X_{it}\beta + \varepsilon_{it}$ (13)
where $\varepsilon_{it} = \alpha_i + \eta_{it}$

assuming α_i **to be uncorrelated with** X_{it}
$i = 1,....,322, \quad t = 1,...,9$

The logistic distribution is used for the binary choice and the estimations with random effects, population average effects and fixed effects are compared.

3.1. Data

The data were collected from the corporate archive provided by Korea Information Service (KIS), Inc.. The KIS provides comprehensive corporate information on over 310,000 Korean companies. The top 10 conglomerate holding companies (*Chaebols*) between 1994 and 2002 were selected which comprise 16 holding companies given the changes in rankings over the years.[9] Having discarded incomplete sample observations, unbalanced panel data were constructed from 322 subsidiaries of the above 16 holding companies for the 9 year period and are used in the analysis.[10]

3.2. Variables

In order to explain the dependent variables of bank mergers and acquisitions (*BMA*) and relationship banking (*RB*)[11], the following explanatory variables are included in the model

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Coase (1937) and Grossman and Hart (1986).
[9] The companies related to top 10 chaebols represent more than 30% of the Korean GDP and those related to top 35 chaebols would bring this figure up to nearly 80%.
[10] The period is stretched over before and after the recent Asian financial crisis and is also long enough to cover common business cycles in Korea.
[11] The discrete choice variable of relationship banking is about whether firms banking with the same principal bank dealt by their holding companies.

(see Table 2): 1/ net income to asset ratio (*NIAR*), 2/ relationship duration with the holding company (*DUR*), 3/ direct ownership by the holding company (*OWN*), 4/ industry dummies (*IND1 to IND13*).

As per relationship banking (*RB*), 39% of the sample firms are banking with the same bank used by the holding company, which is a rather large proportion given the alternatives of independent banking (*IB*). Net income to asset ratios (*NIAR*) vary dramatically from -479 to 372 given the period covering before and after the financial crisis in Asia. Firms included in the sample have the average duration of relationship with holding companies about 18 years. This duration varies from 0 year for newly start-up companies to 72 years for established ones with a long business history. Firms are widely spread over 13 different industries. However, the manufacturing sector has most companies (34.1%) followed by business support and services (13.5%), financial services and insurance companies (12.6%), and retail and wholesale companies (9.1%) in order.

4. Empirical Results

The results for the relationship banking (see Table 5) indicate that important factors determining firms banking relationship choice is the duration of the relationship with the holding companies and the holding companies' ownership stake. The results from the all three estimations suggest that firms with a long term relationship with their holding companies tend to go along with the same relationship banking, i.e. dealing with the same principal banks appointed by the respective holding companies. One could argue that this is due to an information advantage for lenders via delegated monitoring undertaken by holding companies and thus banks tend to offer preferential loan rates to these firms.

Another significant variables in determining firms banking relationship (*RB*) is the holding company's ownership in the firm (*OWN*), which represents the degree of vertical relationship. The insignificant result of the duration variable (*DUR*) in Table 4 can be due to a negative correlation with the holding company's ownership (*OWN*) although it shows significance in Table 5 and 6. The results after having included industry dummies are not largely different from what we see in the specifications without industry dummies. However, there is a certain pattern of industry specific effects. In industries such as real estate conveyance and leasing

(IND10), business research support and service (IND11), and other public and private repair service (IND13), their relationship banks tend to merge. One can say that these industries are the ones that had more serious performance problems after the financial crisis and therefore became target companies for spin-off or liquidation. This perhaps can be explained by the relative importance of those subsidiaries within the conglomerate group and moreover those are the industries which benefit less significantly by the vertical relationship with the holding companies. The rest of the industries show no significant influence on their relationship bank's merger.

The results in Table 5 regarding holding company's ownership (*OWN*) does not coincide with what we expected from the stylised model. However, this may be because some subsidiaries included in the sample data have long enough business history themselves and do not necessarily need repayment guarantees from their holding companies and hence they operate more or less independent from the holding companies, i.e. little holding company ownership. Nonetheless, most reputable large subsidiaries tend to remain with the same relationship banking.

The positive association with relationship banking indicates that banking is driven by the reduction of information cost. Lenders have inferior knowledge about the quality of investment projects undertaken by their borrowers. Clearly, narrowing this asymmetric information gap is in the banks' best interest. The empirical evidence suggests that the banks can reduce this information cost by offering loans to either firms with long-term vertical relationship duration (see Table 5).

5. Concluding Remarks

Main factors determining reaction behaviour between firms and banks are about reducing the asymmetric information gap. Lenders are believed to be not always in a position to know the true state of their borrowers quality of investment projects. Banks often look for this information indirectly using the vertical relationship between borrowers whereby holding companies undertake the responsibility of delegated monitoring.

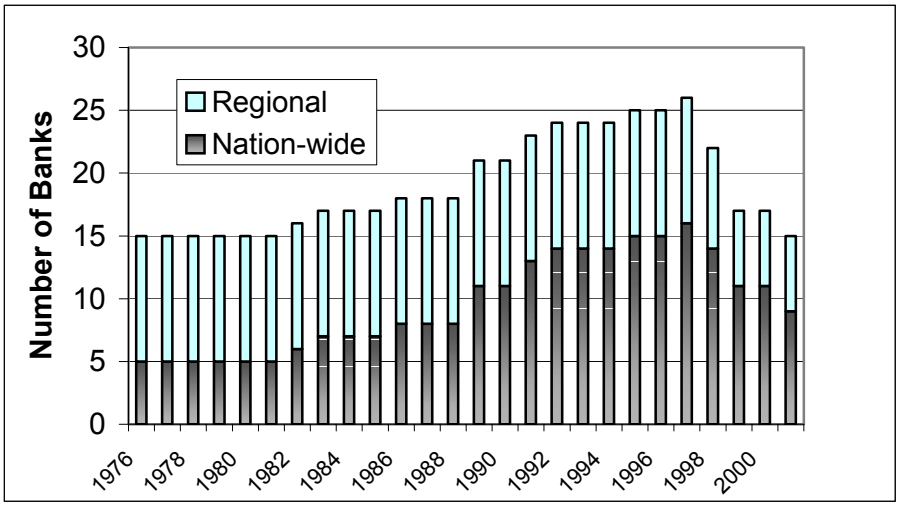
The stylised model results presented in this paper provide evidence that weaker vertical relationship among borrowing firms tend to create more concentrated banking market structures as firms and banks react to each other in a successive bilateral oligopoly. The weaker vertical relationship among borrowers suggests potentially high risk exposure for lending banks, therefore the banking industry can only support a smaller number of banks given the market size of loans. Hence, the degree of vertical relationship is negatively related to banking industry concentration.

On the other hand, the empirical results complements the above claim as the longer the relationship duration among firms tend to lead those firms to deal with the same principal banks appointed by their holding companies. These seem to be logical when banks would like to minimise their risk exposure and reduce their information cost at the same time. Conglomerates in general have very diversified investment portfolio, hence impose less risk to their creditors. In addition, if these less risky holding companies have strong vertical relationships with subsidiaries, it can work as a signal for good quality subsidiaries whilst banks can benefit from delegated monitoring at lower costs.

This paper uses a unique approach in linking the vertical relationship in the real sector (*non-financial firms*) and the horizontal mergers in the banking sector as reactions towards the differentiated vertical relationship among their borrowers. The market power gain in the real sector is to be faced by the countervailing market power in the banking sector. Hence, the policy makers approach towards an abuse of market power needs careful consideration given the above idiosyncratic feature. Perhaps mergers are not always efficient in the case where the bank mergers occur as a countervailing market power as both the banking and the real sectors would enhance their market power. There has been a series of debates as per vertical integration and restraints. This paper tried to shed some light on feasible ways for regulators and/or banks to remedy imperfect information in this context. I would not argue for major reform of policy but would like to provide some economic rationale for a new direction in the event of changing structure of conglomerates and associated banking industry structure.

Appendix

Figure 1. Commercial Banks in Korea



Source: Financial Supervisory Service

Table 1. Number of Commercial Banks in Korea

Korean Banks	***Dec-76***	***M&A***	***R***	***T***	***A***	***Peak Dec-97***	***Mar-03***
Nation-wide	**5**	-8	0	+3	+9	16	**8**
Regional	**10**	-4	0	0	0	10	**6**

N.B: M&A: mergers and acquisition; R: revocations; T: transformations; A: authorisation of new entities.

Source: Financial Supervisory Service

Table 2. Description of Variables

Variables	***Type***	***Operational Definition***
RB	B/D	1 = banking with the holding company's principal bank; 0 = otherwise
BMA	B/D	1 = relationship bank experienced M&A; 0 = otherwise
NIAR	C	Net income to asset ratio
DUR	L/C	Duration of vertical relation with the holding company in years
OWN	L/C	Direct ownership stake by the holding company (%)
IND1	B/D	1 = mining; 0 = otherwise
IND2	B/D	1 = manufacturing; 0 = otherwise
IND3	B/D	1 = Utilities (electricity, gas, water, etc.); 0 = otherwise
IND4	B/D	1 = construction; 0 = otherwise
IND5	B/D	1 = retail and wholesale; 0 = otherwise
IND6	B/D	1 = hotel and food service; 0 = otherwise
IND7	B/D	1 = transportation; 0 = otherwise
IND8	B/D	1 = telecommunication; 0 = otherwise
IND9	B/D	1 = financial services and insurance; 0 = otherwise
IND10	B/D	1 = real estate conveyance and leasing; 0 = otherwise
IND11	B/D	1 = business and research support and service; 0 = otherwise
IND12	B/D	1 = sports and entertainment; 0 = otherwise
IND13	B/D	1 = other public and private repair services; 0 = otherwise

N.B.: Binary (B), Likert (L), Continuous (C), and Discrete (D)

Table 3. Summary of Descriptive Statistics

Variables	*Mean*	*Std. Dev.*	*Min*	*Max*
RB	.386	.487	0	1
BMA	.145	.352	0	1
NIAR	-.740	21.461	-479.26	372.46
DUR	17.868	14.222	0	72
OWN	29.041	32.845	0	100
IND1	.004	.064	0	1
IND2	.341	.474	0	1
IND3	.056	.230	0	1
IND4	.063	.243	0	1
IND5	.091	.288	0	1
IND6	.025	.155	0	1
IND7	.085	.279	0	1
IND8	.022	.147	0	1
IND9	.125	.331	0	1
IND10	.010	.099	0	1
IND11	.135	.342	0	1
IND12	.040	.195	0	1
IND13	.002	.042	0	1

Number of companies: $i = 1,\ldots, 322$
Number of years: $t = 1,\ldots, 9$
Total observation (unbalanced): $N = 2213$

Table 4. Logit Estimation for Relationship Bank's M&A (*BMA*)

Dependent Variable: (BMA)	*Random Effects*		*Population Average*		*Fixed Effects*	
	Coef (S.E)	*Z*	*Coef (S.E)*	*Z*	*Coef (S.E)*	*Z*
NIAR	.003	.97	.002	.84	.004	1.18
	(.003)		(.003)		(.003)	
DUR	-.001	-.29	-.003	-.81	.430	12.27***
	(.004)		(.004)		(.035)	
OWN	-.009	-4.16***	-.010	-5.43***	.005	.44
	(.002)		(.002)		(.011)	
Constant	-1.517	-12.74***	-1.473	-14.26***		
	(.119)		(.103)			
$\chi^2(3)$	18.71***		30.28***		210.03***	
Log likelihood	-896.71				-421.36	
No. of groups	322		322		206	
No. of obs	2187		2187		1484	

,,*** Z-values significant at the 5%, 2.5%, and 1% levels respectively*
,,*** χ^2 -values significant at the 5%, 1%, and 0.1% levels respectively*

Table 5. Logit Estimation for Relationship Banking (*RB*)

Dependent Variable: (RB)	*Random Effects*		*Population Average*		*Pop. Avg. Robust*	
	Coef (S.E)	*Z*	*Coef (S.E)*	*Z*	*Coef (S.E)*	*Z*
NIAR	.002	.23	.000	.37	.000	.24
	(.007)		(.001)		(.002)	
DUR	.056	7.95***	.065	10.26***	.065	5.81***
	(.007)		(.006)		(.011)	
OWN	-.008	-1.95*	.002	.79	.002	.56
	(.004)		(.003)		(.004)	
Constant	-1.422		-1.551	-8.35***	-1.551	-5.17***
			(.186)		(.300)	
$\chi^2(3)$	63.83***		105.44***		35.37***	
Log likelihood	-548.30				-421.36	
No. of groups	291		291		291	
No. of obs	1997		1997		1997	

,,*** Z-values significant at the 5%, 2.5%, and 1% levels respectively*
,,*** χ^2 -values significant at the 5%, 1%, and 0.1% levels respectively*

Table 6. Logit Estimation with Industry Dummies

Logit	*Dependent Variable: BMA*	
	Coefficient (Std. Error)	**Z**
NIAR	.003	1.10
	(.003)	
DUR	.002	.41
	(.005)	
OWN	-.007	-3.09***
	(.002)	
IND1	-.705	-.87
	(.815)	
IND3	-.531	-1.35
	(.392)	
IND4	.088	.33
	(.262)	
IND5	.252	1.16
	(.278)	
IND6	-.073	-.16
	(.449)	
IND7	-.130	-.52
	(.251)	
IND8	-.071	-.16
	(.455)	
IND9	-.237	1.21
	(.196)	
IND10	.819	1.66*
	(.494)	
IND11	.461	2.43***
	(.189)	
IND12	-.532	-1.21
	(.441)	
IND13	1.710	1.69*
	(1.011)	
Constant	-1.728	-10.73***
	(.161)	
$\chi^2(15)$	36.34**	
Log likelihood	-887.23	
No. of groups	322	
No. of obs	2187	

N.B.: The industry reference group is manufacturing industry (IND2).
,,*** Z-values significant at the 5%, 2.5%, and 1% levels respectively*
,,*** χ^2 -values significant at the 5%, 1%, and 0.1% levels respectively*

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