THREE ESSAYS IN FINANCE

By

Jaemin Baik

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Economics – Doctor of Philosophy

2016

ABSTRACT

THREE ESSAYS IN FINANCE

By

Jaemin Baik

Chapter 1, using individual Korean bank loans outstanding data by loans sector, calculates the intensity of herding for lending to specific sector as well as overall lending market by a way of two methods. By looking at the time series pattern of two measures, I examine the change in banks' lending behavior. With the results from two measures, I try to find empirical evidence of significant herding in the past and find some features related to the herd behavior. Also, using the loans data by industry, I investigate further rationality of herding by calculating after adjustment LSV measure to exclude industry-specific rational factor from before adjustment LSV measure. Finally, using one of measures which allows us to get the intensity of individual economic agents, this paper empirically analyze the factors that intensify Korean bank's herding. The result implies that significant extent of herding was followed by Korean banks for lending to both overall lending market and household sector during 2002-2003, and in lending to SME, the herding is considered to have been greatly intensified around 2003 and during 2006 and 2008. In addition, herding tends to get most intensified during times when banks change their lending decisions under the increased uncertainty about expectation for economic conditions.The extent to which the bank characteristics and structural/macroeconomic factors affect the herding intensity seems to vary by the lending sectors.

Chapter 2 investigate whether the bank health and the credit shock to the bank affects its client firm's export using firm-level data for Korean firms, bank-level data on Korean banks, and matched bank-firm loans data during the period 2010-2013. Also, by adding the interaction term between the bank health and the ownership concentration measure, the analysis is extended to test the role of the ownership structure for the firm. I find that the more shares of the firm are held by the family members, the more likely that firm is

to participate in the exports activity. It also implies that the more shareholdings by the family members helps the firm's export activity more resilient when financial health of banks from which the firm borrows get worse. It is not only financial health of its main bank, but also that of all other creditor banks that affects the firm's export activity. Also, when separating the effects transmitted by main bank and other banks at the same time, the main bank plays more significant role than other creditor banks.

Chapter 3 explores the extensive literatures on the effects of the financial shocks and the corporate governance on the firm's real activities. With the growing interest in the global trade collapse after the financial crisis, I am focusing on the impact on the firm's exports. There have been many studies regarding transmission of financial shocks to banks to the firm's real activity and how the quality of the ownership structure affects the firm's decision and dynamics. I explore them and summarize the findings in this paper.

To my beloved wife, Eunyoung,
and my precious three daughters, Seohyeon(Zion), Sevin(Sharon), and Yerin(Jordan)

ACKNOWLEDGEMENTS

Six years in East Lansing, Michigan now feel like a short summer trip. While I was there, however, it felt like a long and risky journey. Though it took much longer than I planned to finish my degree, I stand amazed looking back those times. Along the way, I was never alone. I am honored to recall all the names that made my achievement possible.

First, I would like to express my sincere gratitude to my advisor, Raoul Minetti, for the continuous support for my Ph.D study and the research. His guidance helped me in all the time of research and writing of this dissertation. Without his support, it would never be possible to finish my degree. Besides my advisor, I would like to thank the rest of my dissertation committee members: Chun Zhu, Luis De Araujo, and Kirt C. Butler for their insightful comments and encouragement.

I thank my friends and co-workers at the department of Economics. In particular, I am grateful to Cheol-Keun Cho and Soobin Kim for being such trustful and thoughtful friends and fellow researchers. Special thanks go to Pastor John Won for the constant support of prayer, and to my neighbors, Mr.Cooper, Wakai and Misato for their kindness and help in many ways. I am also very grateful to my parents in Korea for their never-ending trust, help and love. I can never forget the love I got from my uncle and aunt, Kyunghwan and Hannah Baik in Illinois. Their hospitality and selfless support touched my heart every time we went visit them.

My thankful heart goes to my family: my amazing wife, Eunyoung Lee for her joyful soul and thousands of lunch boxes, and my three lovely daughters, Seohyeon, Sevin and Yerin. Thank you all for giving me reasons to live, work and love. Last but not least, I give thanks to my God and savior, who is my all in all. May this humble research give you glory and honor. "Every good and perfect gift is from above (James 1:17).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
Herd Behavior in the Korean Bank Lending Market

"When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing."(Ciitgroup CEO Charles Prince, in an exclusive interview with the Financial Times, July 2007)

1.1 Introduction

Herd behavior is frequently observed in financial markets nowadays causing a turmoil in the financial market and instability even in the real economy. There has been a growing interest in the literature on herding behavior. Theoretic works try to address the motivations of herd behavior and most of empirical studies are focused on the herding in the capital markets. However, considering that the banks play an important role as financial intermediaries and the impact of herding side effects is significant, more attention needs to be paid to bank's herding. Nakagawa et al. (2012) indicates that the deterioration of the real economy in the 1990s may have been attributable partly to the herd behavior in the Japanese loan market during the period of the economic bubble in the late 1980s. Moreover, the intensity of such herding seem to get more pronounced than in the past in line with the acceleration of globalization and financial liberalization.[1] Until the time just before the subprime mortgage crisis erupted, almost every financial institution all over the globe had been trading on subprime mortgage backed securities, and this herding was

[1]Liu (2014) suggests that controlling for macroeconomic and some characteristics of banking industry in U.S., herding has a trend of increasing over time and herding level in the 2000s is significantly higher than in previous decades.

finally followed by worldwide financial meltdown. As suggested by Freixas (2010), bank herding behavior is one of the factors that led banks' underestimate of risk and overinvestment in mortgage lending. That's why bank herding itself is important and need to receive explicit treatment in regulations.

Indeed, herd behavior has been considered as typical behavior of Korean financial institutions including banks for a long time. In the Korean stock market, it is well known that private investors who had less information than institutional investors showed herd behavior especially during bull markets. Herd behavior also occurred frequently in the loan markets even among financial institutions that was known to have more information. Evidence can be obtained, for example, from a lot of articles in newspapers since 2000. The dramatic increase in the household loans outstanding and the competition among credit card companies to increase their credit card lending in 2001-2002 is believed to have originated from herding. During 2002-2003 and 2006-2007, the significant rise in lending to small and medium sized enterprises (SME) is known to be also attributable to banks' herd behavior. However, the information in those articles is based more on anecdotal evidence than empirical study. That's why more empirical investigation should be conducted. Furthermore, as the financial system in Korea has long been bank-oriented, and banks have been playing a major role in the economy, it is important to examine the existence and cause of herd behavior among Korean banks.

The purpose of this paper is as follows. First, I measure the extent to which banks collectively increase or decrease loans to specific categories as well as in the overall loans market in each period by using two herding indexes calculated based on individual Korean bank's loans outstanding data by borrower sector. Herding behavior has been modeled in theoretical works and well documented for capital market herding. However, only a few studies have empirically investigated herding among banks, especially in bank lending decision. This paper is one of the few studies that examines herd behavior in domestic lending market for Korean commercial banks using more recent and long period

of loans outstanding data for individual bank. To obtain herding indexes, I basically look at five loans sectors: large firm, SME (corporate loans), mortgage, housing funds, and others (household loans). And I apply the standard method of Lakonishok et al. (1992) (henceforth LSV) and a more recent measure presented by Kang (2010) (henceforth KHI) to each sector. Second, using and comparing two measures, I examine the change in banks' lending behavior over the sample periods by looking at the time series pattern of measures. and see if we can find empirical evidence about existence of herding for lending to a specific sector and in overall loans market as well. Also, I find some features related to herd behavior in Korean lending market. This study may serve as an empirical comparison of two measure indicators in the sense that this paper is the first paper using both to detect Korean banks herding. Third, I investigate further in detail rationality of herd behavior. Rational (or spurious) herding denotes similar responses by financial institutions to common economic conditions that affect their lending decisions. In the empirical analysis on herding, even if a statistical relationship between loans of different financial institutions is detected, the relationship does not automatically imply the existence of irrational (or intentional) herding. So, following Uchida and Nakagawa (2007), I first obtain (before-adjustment) LSV measure based on Korean banks' loans data by industry, which only excludes rational herding based on macroeconomic conditions. Then, adjusting further for herding resulting from rational behavior by controlling for industry-specific rational factors, I examine the evidence about irrational herding in Korean loans market. Finally, using the measure by Kang (2010) which allows us to get the herding intensity index for individual bank, I empirically analyze the factors that intensify herding of Korean banks in the domestic loan market. Liu (2014) also investigates if the change in the patterns of herding measures are related with macroeconomic variables and banks condition along time. However, in order to obtain explanatory variables for estimation representing characteristics of banks, he aggregates all data on balance sheet and income statement across all banks, because LSV index used as dependant variable

measures only herding of overall banking industry for each category of loans. In this paper, however, I investigate effects of characteristics of individual bank as well as market structural/macroeconomic factors on the intensity of individual bank's herding. For this reason, the herding measure by Kang (2010) is used as dependent variable because it gives us herding index for individual bank.

1.2 Literature Review

In this section, I first review related literature that provides three basic explanations for herding: flow of information, reputation/compensation model, and institutional incentives.

Devenow and Welch (1996) define it as a behavioral pattern correlated across individual agents, and Bikhchandani and Sharma (2000) point out it is herd behavior when individual economic agents make similar choices after observing others' behaviors. Hirshleifer and Hong Teoh (2003) define herding as the similarity of behaviors resulting from interaction among economic agents.

One of the primary reasons for herding is the flow of information. Herding related to information flow among economic agents was analyzed first by Bikhchandani et al. (1992) and Banerjee (1992). When economic agents have insufficient information or are not capable of analyzing information, they refer to and imitate the preceding behaviors of other economic agents to make decision. Sias (2004) shows some evidence that implies institutional investors in stock market herd as a result of deducing information from each other's trades. For banks, Barron and Valev (2000) show that banks with less wealth tend to avoid information gathering and follow banks with more wealth that can easily get information. Therefore, smaller banks have an incentive to follow the behavior of (presumably better informed) larger banks, and banks are endogenously separated into leaders and followers.

An alternative explanation is the reputation/compensation model first developed by

Scharfstein and Stein (1990). In the reputation model, a bank manager has incentives to mimic other banks' managers because managers want to protect their reputation. If the action results in a good outcome, he/she benefits. Even if the action yields a bad outcome, the fact that other managers made a similar choice shields the manager. It is safer for them to err together than individually. Borio et al. (2001) argue that the reward structure that limits blame in the case of collective, as opposed to individual failure, is the most common factor behind bank herding behavior. According to the compensation model, it is difficult for a principal to evaluate the ability of an agent, he/she evaluates the agent based on the performance of other agents who are engaged in the same business. And this leads the agent having a risk-averse utility function to follow the other agents' behavior in order to narrow the gaps in their rewards across different circumstances. Rajan (1994) also points out an example of bank managers who tend to imitate other banks' behavior by accumulating a lesser amount of loan loss provisions in order to avoid criticism.

The papers that look at institutional incentives are concerned mostly with the following problem: If one small bank fails, the deposit insurance can guarantee all the depositors receive their savings back and the economy will not suffer from the bankruptcy. If many small banks fail at the same time, the consequences are different. The banking sector is crucial for the existence of any modern economy, so the failure of several banks can disrupt the normal functioning of the real economy. As a consequence, the government is compelled to rescue the banks. In other words, if many small banks fail together, it is equivalent to when one big bank fails. This is the main reason why banks have incentives to copy the actions of its competitors. If a bank is going to fail, it prefers to do so with company so the chances of being rescued are higher. Acharya and Yorulmazer (2007) carefully evaluate the government's time inconsistency problem that leads it to bail out banks that fail. The paper's main argument is that when many banks fail, it is ex-post optimal to bail out the banks, whereas when few banks fail, the banks that survive acquire those that fail. Therefore, banks find it optimal to herd so they can survive or fail together

since surviving alone means having to take the risks to acquire failed banks. This paper also shows that small banks have stronger incentives to herd than large banks. When a small bank imitates a large bank, the probability of being bailed out is higher when there is failure than if it differentiated itself. However, big banks have little extra benefit from copying a small bank's behavior.

Some related studies tend to interpret any collective behaviour of banks as herding that causes inefficient outcomes. However, this collective behaviour does not necessarily correspond to the existence of bank irrational herding and its inefficiency. The collective behaviour by banks can stem not only from the existence of their herding, but also from banks' responses to changes in economic environments that uniformly affect the loan demand by borrowers and the loan supply by banks. However, as mentioned in Bikhchandani and Sharma (2000), it needs pointing out that empirically distinguishing rational (or spurious) herding from irrational (or intentional) herding is easier said than done and may even be impossible, since typically a multitude of factors have the potential to affect an investment decision. Uchida and Nakagawa (2007) exclude further industry-specific rational factors from LSV measure, because even if LSV measure does not include banks' rational decision based on overall macroeconomic conditions, this does not necessarily imply that banks are irrational when LSV measure indicates the existence of herding.

Few studies have empirically investigated whether herding is observed among banks, especially in bank's lending decision. Since the seminal work related to banks herding in the loan market by Jain and Gupta (1987), most of studies has focused on the Japanese banks, because it has been argued that herd behavior is a typical action of Japanese banks, and their behaviour has been often criticized as a symbol of the inefficiency of the Japanese financial market. Jain and Gupta (1987) and Barron and Valev (2000) examine causality in loans outstanding to Latin American countries aggregated by bank type to find herding among groups of banks in the U.S. in 1980s. They find that small U.S. banks replicate the lending behavior of large U.S. banks in lending to developing coun-

tries. Based on this, Nakagawa and Uchida (2011) investigates whether Japanese banks followed herd behavior during 1980s and 1990s using data of loans outstanding by types of banks. Their empirical results show the evidence for herd behaviour in lending between different types of Japanese banks in 1980s. First, herding is observed in the early to mid 1980s, which is immediately after the beginning of financial deregulation. Second, herding is observed in loans to new borrowers who became new customers after financial deregulation. Finally, banks were inclined to follow the lending behaviour of banks that were considered to be more informed about the new borrowers. Nakagawa (2008) finds leader-follower relationships between lending behavior by different types of Japanese banks in urban and regional cities respectively. They imply that local banks follow major banks in urban cities, while local banks follow each other in regional cities. In addition, herding is mostly caused by local banks and more frequent in regional cities than in urban cities. However, these studies investigate the relationship between loans of different groups of banks.

Uchida and Nakagawa (2007) is one of the first empirical studies that use the herding measure by Lakonishok et al. (1992)(LSV)[2], calculated using the data of individual banks' loans outstanding to detect herding of Japanese banks. They identify the great extent of herding of major banks in lending around the late 1970s, when Japan was hit by the second oil crisis, during the bubble period of the late 1980s, and in the 1990s when the bubble collapsed and stagnation followed. Also, adjusting further for herding resulting from rational behavior, they observed evidence on the existence of irrational herding only in the bubble period. Liu (2014), using Call Report data, finds that U.S. commercial banks have been following herding behavior in the domestic loan market from 1976 to 2008. Specifically, herding occurred in four out of five NBER-dated recessions during the sample periods and there has been a sharp increase in herding since early 2000s.

In spite of many studies examining the existence of herding by financial institutions,

[2]See the details in the next section.

it is difficult to find any previous studies that empirically analyze the factors affecting herding intensity of bank especially in lending market. Liu (2014) is the one that explores explicitly relationships between herding measures and macroeconomic/bank conditions. First, regression results indicates that banks tend to herd more when there are more uncertainties in the market and supports the flow of information hypothesis. Second, it indicates that banks tend to follow each other when the condition of the banking systems are less favorable. Third, he calculates herding measures for banks of different sizes and find a higher level of herding among small banks during most of the sample periods, suggesting that herding in lending decisions is more likely to be induced by information concerns since small banks have less information and incur higher cost of acquiring information. Before that, Graham (1999) investigated the factors affecting herding. However, it is based on the herding of investor newsletters. The leading newsletter is perceived in advance in Graham (1999)'s study and the optional behavior of the newsletters are just simplified as two: to follow or not to follow the leader. For this case, it is easy to grasp the intensity that the other newsletters follow the leading one without using the herding index. For the lending market of Korean bank, on the other hand, no surely leading bank seems to exist and even if there is, that bank could be replaced with others over times. Not only that, as banks decide the size of their lending, their numbers of options the banks could have are unlimited. For this reason, I use the herding index which will be derived in Section 3 for empirical analysis of the factors which cause herding in bank's lending market in Korea.

1.3 Measurement of Herding Intensity

1.3.1 Methodology

To demonstrate the existence and trend of herd behavior and analyze the factors intensifying herding in bank lending among Korean banks during the sample periods, it is

necessary for us to measure the herding intensity.

LSV measures the intensity of herd behavior of money managers by capturing deviation of decision by individual money manager on buying or selling a given stock from overall market's average investment decision. In Lakonishok et al. (1992), they use equity-type fund data for the years between 1985 and 1989 in order to estimate whether herding took place among fund managers and show that there had been no obvious herd behavior. Since this study, the LSV measure has become the most frequently-used measure to quantify herd behavior among equity investors. The measure is a standard in the literature and applied in numerous studies mainly for stock market.[3].

Uchida and Nakagawa (2007) first used LSV method to measure the herding intensity in bank lending market. The LSV index for analysis of herd behavior in bank lending to a particular category i in time t is defined as:

$$LSV_{it} = |P_{it} - P_t| - E|P_{it} - P_t| \tag{1.1}$$

where P_{it} is the proportion of banks that actually increased their loans outstanding to category i in time t and P_t is the expected proportion of banks that increased their loans outstanding in t, which is calculated as a mean of all the observed P_{it}s in time t.[4] This can be considered as an indicator of the banks' overall lending policy. If every bank independently expands (or reduces) its loans outstanding to sector i in time t with probability P_t (or $1- P_t$), the observed value of P_{it} becomes close to P_t and the first term will become zero. If, on the other hand, banks collectively increase or decrease loans to category i in time t, the observed value of P_{it} departs from P_t. The first term of equation (1.1) thus quantifies the extent to which banks' lending policies to the sector i in time t deviate from the overall lending policy in time t.

[3]For example, see Grinblatt et al. (1995), Wermers (1999), and Choe et al. (1999). See Bikhchandani and Sharma (2000) for survey of such studies. More recent studies include Wylie (2005).

[4]$P_{it}=\frac{X_{it}}{N_{it}}$, where N_{it} and X_{it} are the numbers of banks that were active in issuing loans and that increased loans outstanding to category i in time t respectively.

Note that even if there exists no herding, the expected value of the first absolute term of LSV_{it} is positive. The last term $E|P_{it} - P_t|$ is subtracted so as to normalize the measure and make its mean zero under the null hypothesis of no herding. Because the LSV is calculated based on the assumption of binary distribution where, if there is no herding, banks increase loans outstanding to category i in time t with probability of P_t and decrease with probability of $(1 - P_t)$, $E|P_{it} - P_t|$ represents expectation of binary distribution.[5]

Values of the LSV herding measures thus can be interpreted as the tendency of banks to increase loans to a given category in a given time above the random distribution of lending decisions. Positive values of the LSV measure that differ significantly from zero provide evidence of herding behavior. The higher the LSV measure, the stronger the herding. Then the overall LSV index for each time t (LSV_t) is derived by obtaining a sample mean of LSV measure among all categories:

$$LSV_t = \frac{1}{I}\sum_{i=1}^{I} LSV_{it} \tag{1.2}$$

where, I is the number of loan categories. Since P_t is suctracted from P_{it}, the measure does not include banks'rational decisions based on overall macroeconomic conditions.

However, this does not necessarily mean that banks are irrational in the sense that rational banks make lending decisions not only based on overall macroeconomic conditions but also on conditions specific to individual loan sector, i. Even if P_t is subtracted from P_{it} in the measure, it could still reflect an increase or decrease in loans outstading based on sector-specific rational factors. In order to get the adjusted LSV herding measure which eliminates sector-specific reasons for herding, following Uchida and Nakagawa (2007), we estimate the following equation by the ordinary least squares:

$$P_{it} - P_t = a + bX_i + \epsilon_{it}, \tag{1.3}$$

[5] $\sum_{X_{it}=0}^{N_{it}} \left[\left| \frac{X_{it}}{N_{it}} - P_t \right| \left\{ {}_{N_{it}}C_{X_{it}} P_t^{X_{it}} (1 - P_t)^{1 - X_{it}} \right\} \right]$

where X_i is a vector of sector-specific control variables. ϵ_{it} represents the portion of herding which cannot be explained by rational factors. Therefore, we can obtain the adjusted LSV herding measure that quantifies the extent of herding after adjustment as follows:

$$LSV_{it}^{A} = |\epsilon_{it}| - E|\epsilon_{it}|. \tag{1.4}$$

LSV index has some advantages over other methods: it measures the herding intensity more easily than other measures do and we can test the statistical significance of herding. As, by definition, P_{it} follows a binomial distribution with mean P_t and variance $P_t(1-P_t)/N_i$, we can get the Chi-squared values for each loan category by defining a statistic, $Z_{it} = \frac{P_{it}-P_t}{\sqrt{P_t(1-P_t)/N_{it}}}$which is known to approximate the standard normal distribution under some conditions.[6] Using this feature, we can find the statistical evidence of whether herding exists or not for the lending to the specific loan category at some period. Nevertheless, it has the following limitations (Bikhchandani and Sharma (2000)). First, in LSV method, the herding intensity is determined by the numbers of investors buying or selling stocks for a certain period. In reality, however, the fluctuation in stock markets is determined by the size of buying or selling rather than numbers of buyers or sellers, and this could make LSV index differ from the fluctuation in stock markets . Second, using LSV index, it is impossible to identify intertemporal behavioral pattern.measure the herding resulting from the interaction among economic agents. This is because LSV index appears higher even if investors respond to common information at the same time. Third, although is is possible to measure the average herding intensity for a certain group by using this method, it is impossible to measure the herding intensity of individual agents. Fourth, although it is possible to measure the herding intensity among investors/banks within a certain group by using this index, it is impossible to measure the herding intensity for an entire market. In respect of an entire stock market, sellers exist whenever

[6]From equation (1.1), this equals (the non-absolute value of) the first term of the LSV measure which is normalized for its variance to take the value of 1 under the null hypothesis of no herding. See the Uchida and Nakagawa (2007) for more details on the test (p568-569).

there are buyers, which makes it impossible to figure out toward which direction herding occurred only by using LSV method. As the LSV method for analyzing herd behavior in bank lending market measures the herding intensity on the basis of numbers of banks that increases loans during one period only, it has the limitations the LSV presents with the exception of the fourth. However, LSV index is still used as standard measure in many empirical studies to investigate whether herd behavior is followed by financial institutes including banks.[7]

Several alternative measures have been proposed. However, they are less useful or not appropriate to capture herd behavior among banks. Wermers (1994) develops a method of measuring herding intensity by using a time lagged correlation, which is known as the Portfolio Change Measure (PCM) (Bikhchandani and Sharma (2000)) allowing us to take into account the intertemporal behavioral pattern between economic agents. However, it is still impossible to identify the herding for an individual agents. For this reason, few studies use it for their empirical analysis (Uchida and Nakagawa (2007)). Jain and Gupta (1987) conduct the analysis of the lending behavior of U.S. banks using the Granger causality coefficient. It solves the second problem with LSV, but it is also impossible to detect the intensity of individual agents' herding.

Kang (2010) suggests a new herding index which makes it possible for us to measure the herding intensity of individual bank as well as that of overall banking industry. We can measure the intensity of herding for individual banks using time lag correlation. That is, the herding index of bank i ($KHI^i_{t,t+k}$) for the $k+1$ periods, which is between t and $t+k$, is derived by the following time lag correlation coefficient:

$$KHI^i_{t,t+k} = \frac{\sum_{j=0}^{k} (\triangle L^m_{t+j-1} - \triangle L^{mA}_{t-1,t+k-1})(\triangle L^i_{t+j} - \triangle L^{iA}_{t,t+k})}{k \cdot \delta^m_{t-1,t+k-1} \delta^i_{t,t+k}} \tag{1.5}$$

[7]For example, see Wermers (1999), Choe et al. (1999), Wylie (2005), Uchida and Nakagawa (2007), Liu (2014),

where, $\triangle L^{m}_{t+j-1}$ denotes the average growth rate of loans outstanding of whole banks except bank i at period $t+j-1$, $\triangle L^{mA}_{t-1,t+k-1}$, $\delta^{m}_{t-1,t+k-1}$ the average and standard deviation of $\triangle L^{m}_{t+j-1}$ respectively between $t-1$ and $t+k-1$, $\triangle L^{i}_{t+j}$ growth rate of bank i's lending at period $t+j$ and, $\triangle L^{iA}_{t,t+k}$ and $\delta^{i}_{t,t+k}$ the average and standard deviation of $\triangle L^{i}_{t+j}$, respectively between t and $t+k$. By using the herding index obtained above, I derive the herding indexes for all individual banks' lending activity, and the average herding index of whole banking sector for each of loans category by averaging the indexes.

$$KHI_{t,t+k} = \frac{1}{N}\sum_{i=1}^{N} KHI^{i}_{t,t+k} \tag{1.6}$$

where N is the number of banks.

KHI is determined by the size of lending, not just the number of banks that expanded lending as in LSV. Also, it is derived using time lag correlation coefficient, which captures the herding caused by interaction among banks. And unlike the LSV and PCM that measure average herding of a certain group, KHI measures herding of individual bank. Finally, this index derives correlation across several periods rather than between two periods in order to substantially reduce the noise caused by irregularity of times series.

In this paper, I use both LSV index and KHI to measure herding intensity. The former is not only standard one in the existing literatures, but also capable of excluding rational herding. Also, the latter is useful in the sense that it improves the previous ones with more theoretical conformity especially for analyzing the herding by banks in the lending market.

1.3.2 Data

The primary data source I use for constructing the herding indexes and characteristic variables of individual bank used in the estimation is the Financial Statistics Information System (FISIS) and Financial Institutes Management Analysis System database from Finan-

cial Supervisory Service (FSS). These database contain a part of data on banks' individual-entity lending activity loans they report to FSS mostly on quarterly basis. To calculate the herding indexes, I use two types of loans outstanding data by individual bank. First, I use loans data by borrower sector to investigate extistence of herding in Korean loans market, as it is usually claimed that banks follow herding in lending to specific sector. The loans outstanding data by borrower sector are largely categorized into three borrower groups: firm, household, and public sector. The loans to the firms are divided into two sectors - the large firm and SME - and the household loans into three sub-categories - mortgage loans, housing funds[8], and others[9]. These five categories for loans data by borrower sector - large firm loans , SME loans, mortgage loans, housing funds, and others - are used to measure the herding by LSV and KHI index for the sample period of 2000:1Q-2012:2Q.[10] Second, the loans outstanding data by industry are used to further explore rationality of herding. The data to the following nine industries by individual bank are available between 2003:3Q and 2012:2Q: (1) Agriculture, Forest and Fisheries, (2) Manufacturing, (3) Construction, (4) Wholesale and Retail, (5) Accommodation and Food, (6) Telecommunication, (7) Real Estate, (8) Service and others, and (9) Household. Loans outstanding to these nine types of industries are used to calculate LSV before and after adjustment. Most of macroeconomic factors used as explanatory variables for estimation later are from Economic Statistics System (ECOS) database from the Bank of Korea. I use the quarterly data between 2000:Q1 and 2012:Q2.

In Korea, commercial banks consists of nationwide banks, local banks, and branches of foreign banks. In this paper, banks' herd behavior in lending market is focused on the domestic loans in Korean Won. To this end, branches of foreign banks are excluded from the sample as their proportion of loans outstanding in domestic loans is very low.

[8]Housing funds are loans made only for the purpose of purchasing or renting the house.

[9]Most of them are (unsecured) individual credit loans.

[10]Out of five loans categories, data for mortgage, housing funds, and others are available only from 2003:3Q, while loans to SME, large firms, and household are available from 2000:1Q. Besides, loans to public sector are excluded in the analysis as they are determined mainly by demand.

13 commercial banks (7 nationalwide and 6 local banks) that are currently in business are the subjects of the analysis, while those that were taken over during sample period are included for our purpose in merged banks.[11]

Figure 1.1 presents shares of loans outstanding held by 13 commercial banks for each sector. In 2000, the corporation loans (SME and large firms) occupy over 60% of total loans outstanding. However, since then, the proportion of household loans increases fast until the late 2005, when they account for about 56% of total loans outstanding. As of 2012:2Q, the share of corporation loans is 50% and household loans have 48% of shares. Among corporation loans, the proportion of loans to large firms reduced from 18% in 2000:1Q to 4% in 2007:1Q, but since then it kept increasing to about 12% in 2012:2Q. Loans to SME show relatively stable share of 40% on average during 2000:1Q-2012:Q2. Loans outstanding of loans to public and other sectors such as local government, public corporation and non-profit organization have very low share. Figure 1.2 shows in detail the proportion of each loans category for household loans. Mortgage loans takes most part of household loans and its portion has increased over time, while the share of both housing funds and others has diminished. Considering this, the intensive herding in the lending to SME and/or in mortgage loan market could be more influential to the economy.

1.3.3 Analysis by Herding Measures

Now, I examine the change in banks' lending behavior over the sample periods by looking at the time series pattern of measures. and see if we can find empirical evidence about existence of herding for lending to a specific sector. Also, I find some features related to herd behavior in Korean lending market and investigate if some characteristic of herding is consistent with the relevant theories.

[11]The amount of lending, non-interest income(commission income + other operating income), total revenue, equity and risk weighted asset are aggregated to derive the total loan, herding intensity and BIS capital.

Figure 1.1 Shares of loans outstanding by all banks

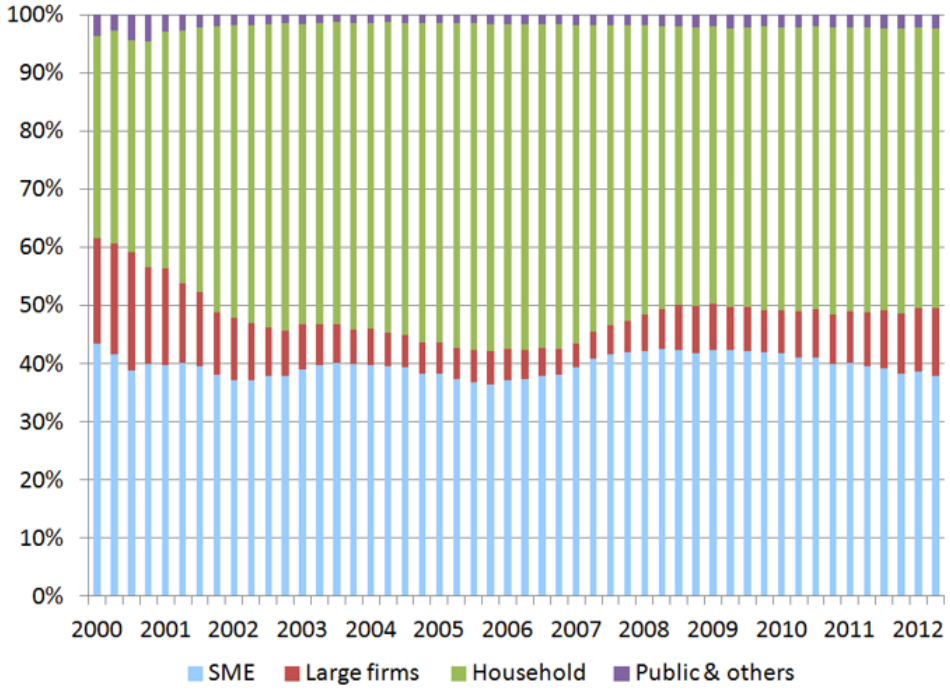
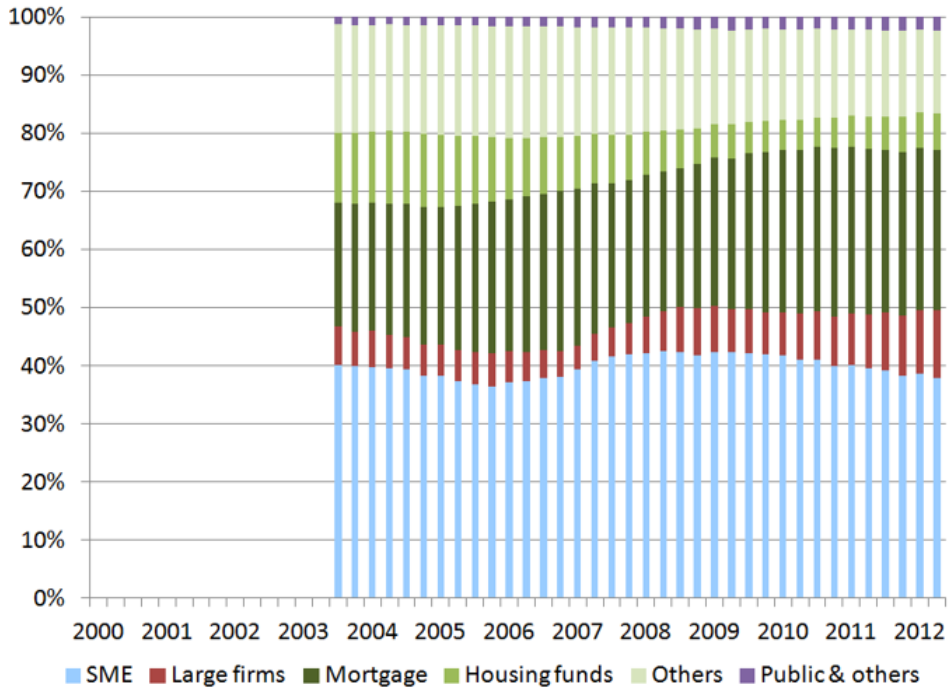


Figure 1.2 Shares of loans outstanding by all banks (detail)



Here, I look at the herding pattern using the loans outstanding data by borrower sector. By using the equation (1.5), I first derive KHI, the herding indexes for all individual banks' lending activity. To this end, the value of k needs to be determined first. As the value of k can be seen to represent how long one bank's internal decision making process and fundamental lending behavior may persist, it is determined based on the following reasons. First, it is known that the Korean banks' herd behavior in the lending to the specific sector happened every two years and lasted up to two years since 2000.[12] It means that the banks are likely to keep the same lending behavior for those periods interacting with other banks. Second, it is assumed that banks internal decision making and their lending behavior may be affected by the change in the CEO. Because the term of office for the Korean commercial banks' CEO is usually two or three years, it is likely to change the bank's lending decision fundamentally. Considering all these, I use two years (eight quarters, $k = 7$) average herding index throughout the analysis. Notice that KHI derives the correlation across $k + 1$ quarters, so, as expected in the equation (1.5), higher value of k reduces the noise more caused by irregularity of time series. (See Figure 1.3-1.6)[13]

Figure 1.7 represents the herding by all banks in overall loans market[14]. Looking at the time series pattern of the KHI, for the simplicity of analysis, I focus on the local peak point assuming that banks' herding is most intensified around that period. For the overall loans market, Korean banks seem to follow a cyclical herding pattern over the sample periods. The herding measure reached historic high of 0.65 around 2003:1Q. After that, two more local peaks appear in 2005:4Q and the 2008:2Q, even though they do not seem to be as intensive as one around 2003.

[12]Household credit loan (2001-2002), SME loan (2003-2004, 2006-2007), household mortgage loan (2005-2006)

[13]Note that the herding index, $KHI^i_{t,t+7}$, at a certain period implies the average herding intensity, which consists of current period and the following 7 quarters (2 years). So, in the graph for $KHI^i_{t,t+7}$, the horizontal axis is $t + 2$, which is the median of periods over which the time lag correlation is derived.

[14]Note that when using KHI to calculate the herding measure for overall loans market, it is directly obtained by using equation (1.5) and (1.6) with total loans outstanding data. On the other hand, the LSV measure for overall loans market is obtained by calculating the measure for each loans category first in equation (1.1) and averaging them in equation (1.2).

Figure 1.3 $KHI^{i}_{t,t+k}$ for overall loans markets, k=1

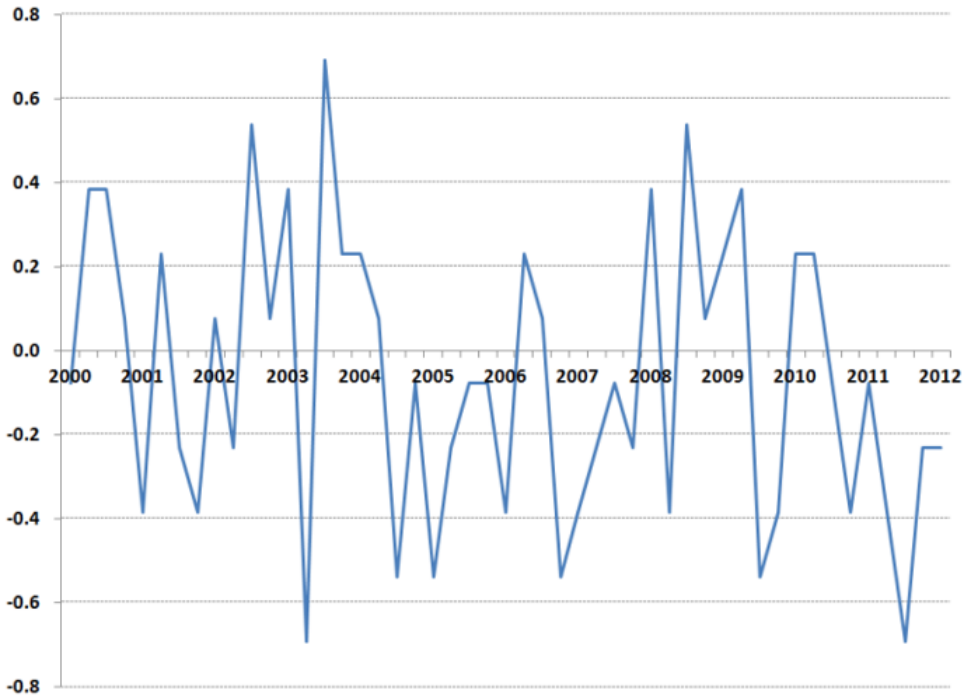


Figure 1.4 $KHI^{i}_{t,t+k}$ for overall loans markets, k=3

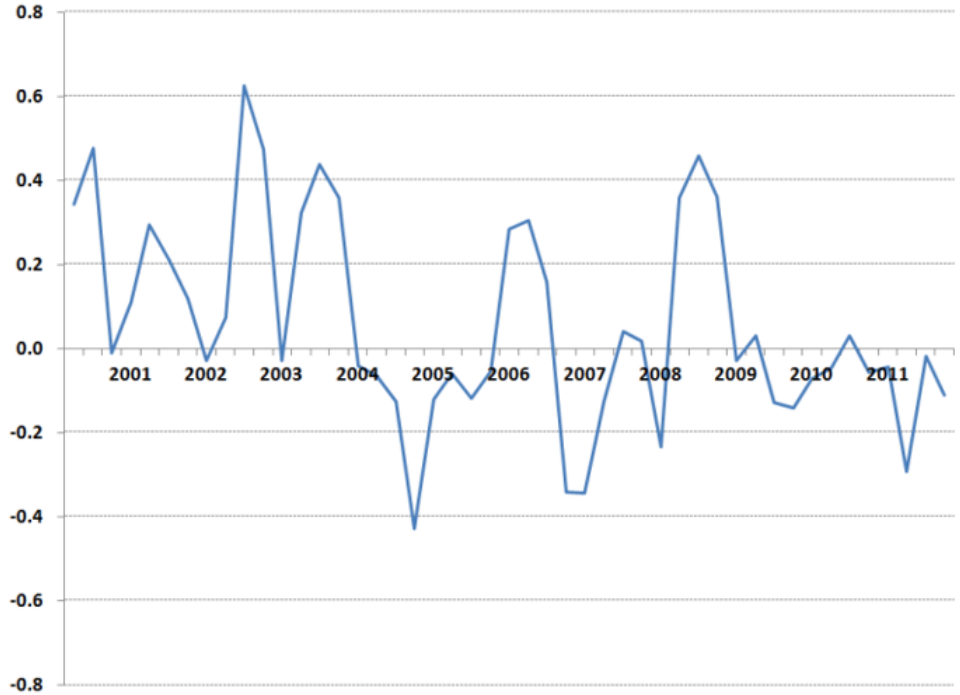


Figure 1.5 $KHI^{i}_{t,t+k}$ for overall loans markets, k=5

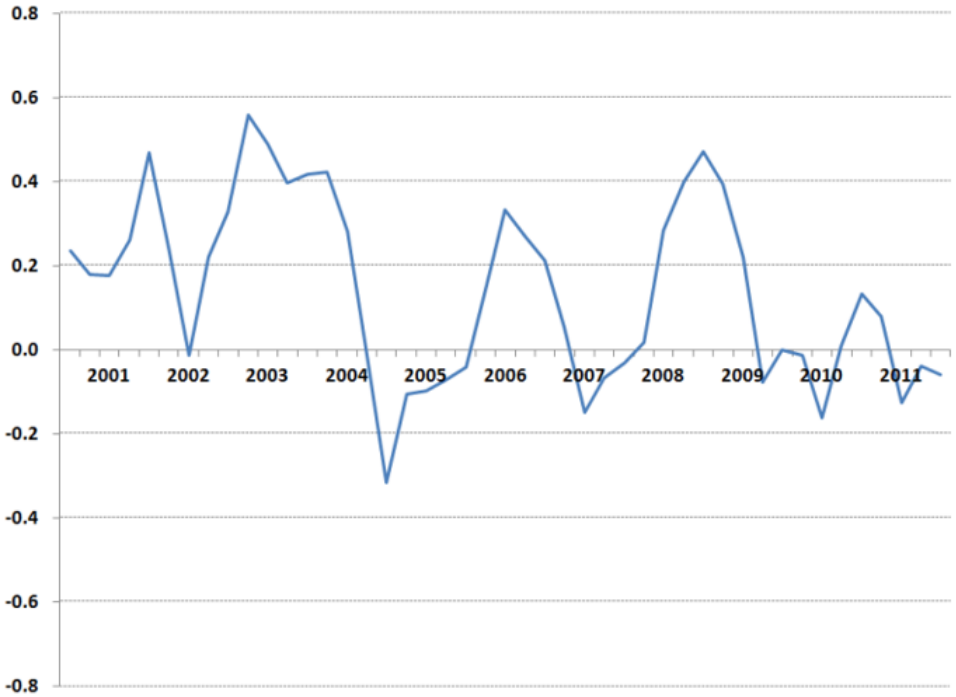


Figure 1.6 $KHI^{i}_{t,t+k}$ for overall loans markets, k=7

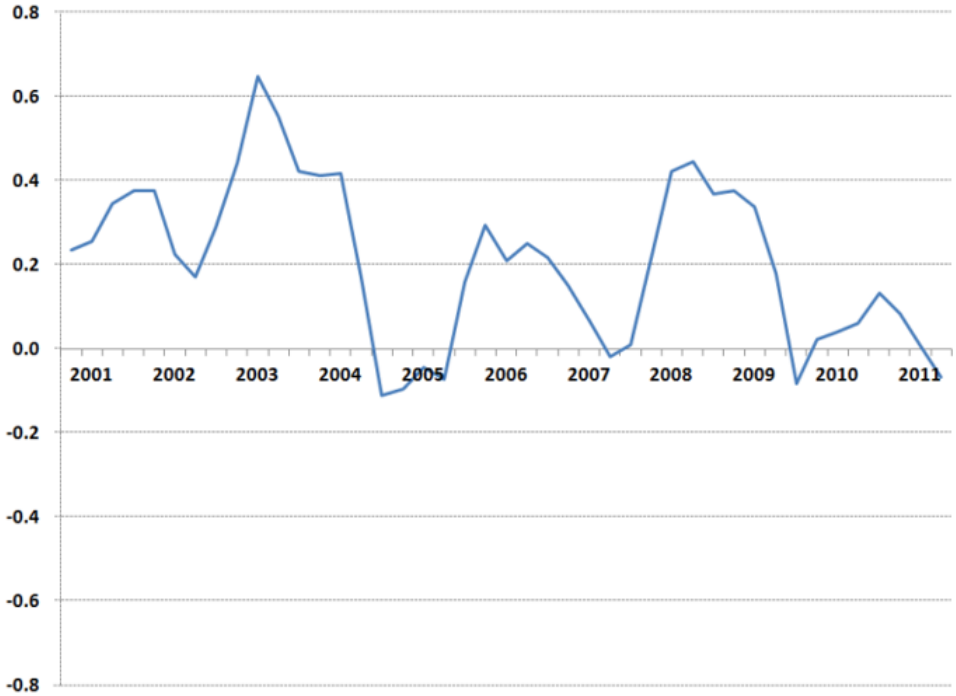


Figure 1.7 Herding in the overall loans market (KHI)

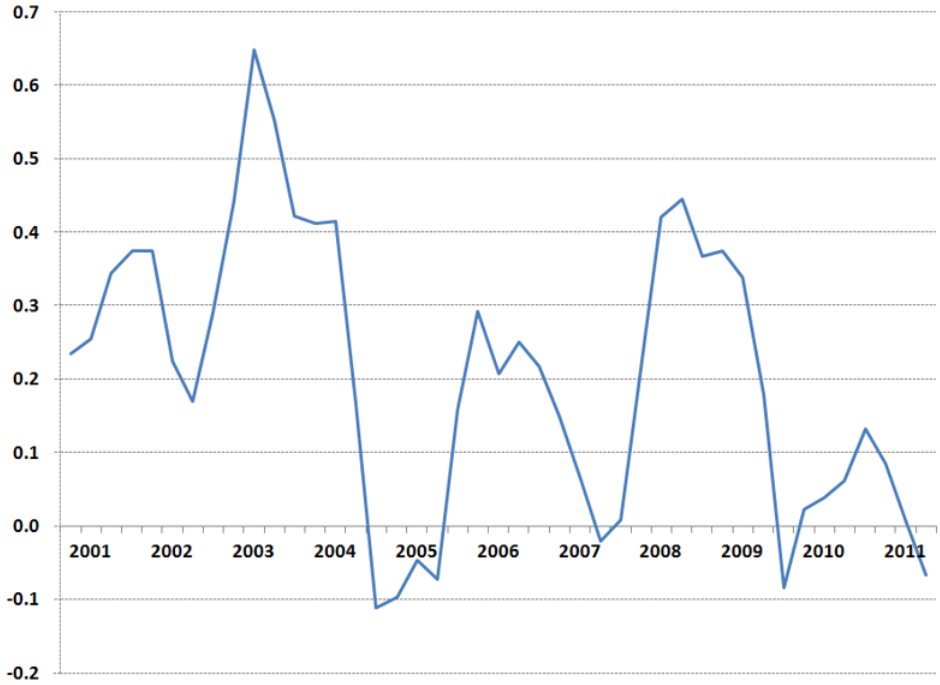
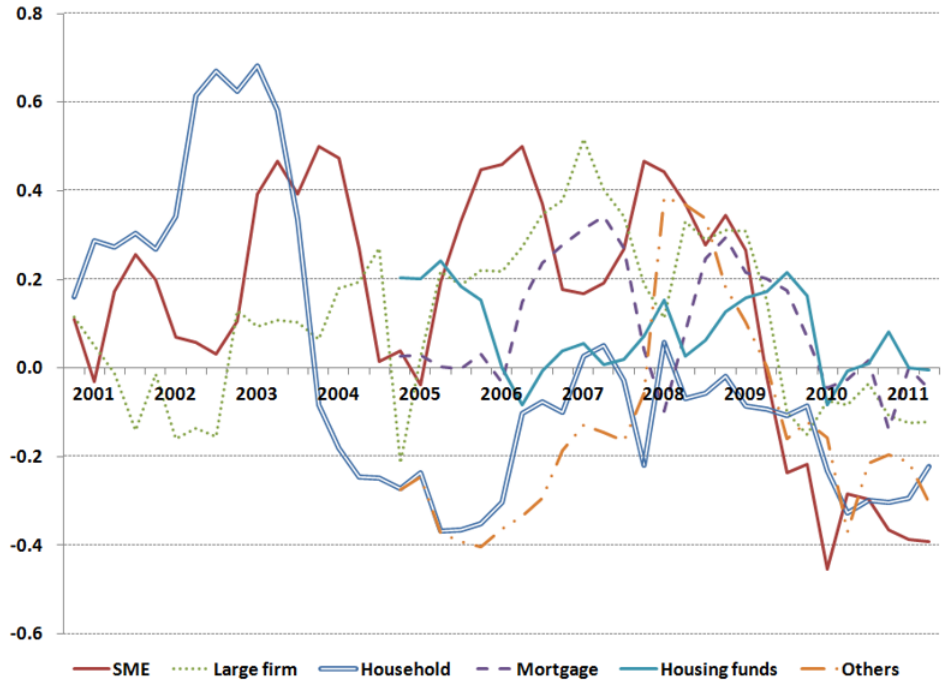


Figure 1.8 represents the herding pattern for each sector.[15] The herding index for household loans, increasing steadily from the beginning of the sample period, exceeded 0.6 during the period between 2002:2Q and 2003:1Q. This seems to stem from the fact that financial institutions in Korea sharply expanded their lending to households as Korean government has eased regulation on housing loan and taken policy to encourage credit card use in order to stimulate domestic economic activity in 2001. On the other hand, the occurrence of highly intensified herding exceeding 0.6 in terms of its index in the lending to household market brought about side effects of radically increasing delinquency in household lending. Thus, the historic high level around 2003 in overall lending market seems to be led mainly by the herding in the lending to the household sector. Also, herding for the lending to SME seems to follow the cyclical herding pattern, which looks similar to that for the overall loans market. It could be inferred that Korean banks' herd behavior in the overall loans market is mainly caused by herding for the lending to SME.

[15]Since the loans outstanding data for the sub-categories of household are available only from 2003:3Q as mentioned before, the (total) household data are used here to show which sector contributed to the high level of herding around 2003.

Figure 1.8 Herding by borrower sector (KHI)



The herding measure for lending to SME remain high between early 2003 and early 2004. The index also reached high around 2006 and 2008. When it comes to the lending to mortgage market, herding index was at its highest level around 2007 and late 2008, but they seem to be relatively lower than that for lending to household and SME.

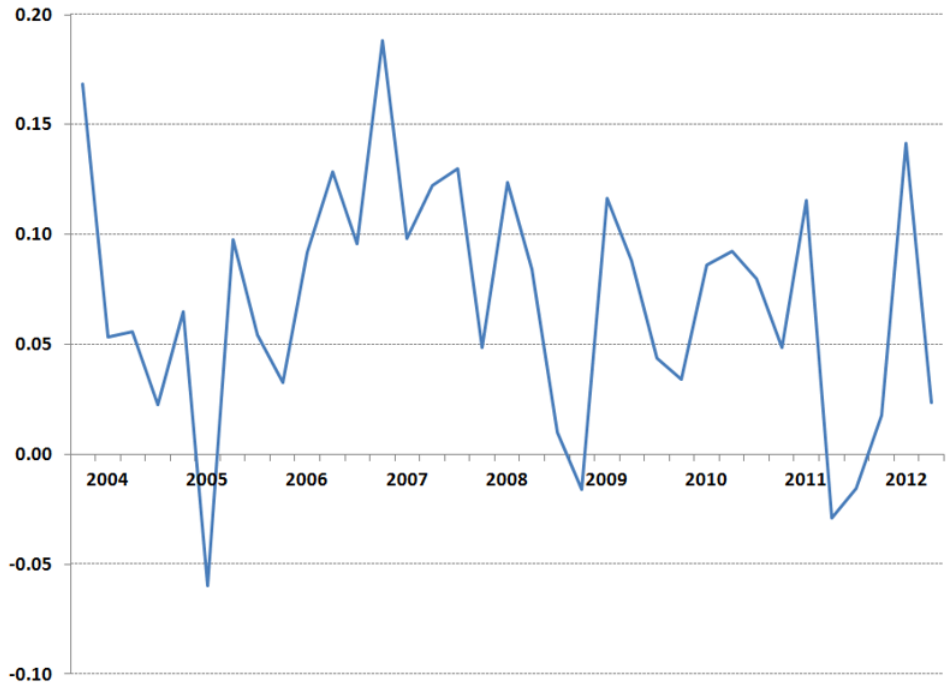
Also, we can see that while the herding indexes of lending to SME showed the three local peaks with relatively high level of indexes every two or three years, the herding intensity for lending to household, reaching the historic peak of 0.68 in 2003:1Q dropped sharply until 2005:2Q and stayed below up to now except during a couple of quarters. This can be explained by two factors. First, before the currency crisis in 1997, Korean banks were strictly regulated both explicitly and implicitly in all business areas (e.g. loan amounts, interest rates, borrowers, fees). In particular, the banks were forced to allocate more credit to the firms rather than household. However, after a series of financial deregulation measures were introduced in the late 1990s along with restructuring the financial system as well as the firms, banks began to increase the loans outstanding to household which was considered to be less risky but more profitable than the loans to the firms.

Deregulation helped to boost the loans outstanding and loan shares of household beginning in the late 1990s.[16] In those periods, herding is observed particularly in lending to household possibly due to the lack of information about the new customer sector, which is also consistent with Jain and Gupta (1987) and Barron and Valev (2000). They find that herding by U.S banks occurred in the 1980s, when they increased lending to Latin American countries that were new borrowers for them. Nakagawa and Uchida (2011) also argue that Japanese banks followed the herd behavior in the early to mid 1980s, when banks made loans to the new emerging industries immediately after financial deregulation began. Second, after the credit card crisis in 2003 in Korea, every efforts were made by government and bank regulator to develop the centralized system that collects the personal credit information from each bank and share them with all the banks. It helped to lessen the asymmetric information problem in the household loans market and contributed to reduction in the herding behavior by banks for lending to household. Finally, we can see that the intensity of herding has weakened in recent years.

The LSV measure for Korean banks during 2003:4Q-2012:2Q are depicted in Figure 1.9. It looks very volatile, so it is difficult to detect the trend of herding intensity relative to KHI. That is because the only corresponding period of loans outstanding data is taken into account to calculate the LSV measure for that time, while the time series curve for KHI is smoothed out by capturing the average intensity of herding for the following eight quarters. However, it can be said that the time series pattern for heding identified by LSV is partly consistent with that of KHI in the sense that the intensity of herding decreases by 2005 and it reaches high level late 2006. In addition, herding is intensified in the first quarter of 2008 and 2009 each as is also case with KHI. If we define existence of herding based on the 5% significance level and assumption that the herd behavior by banks in lending market persist over some quarters, we may identify when statistically significant

[16]In the late 1996, the loans outstanding by Korean commercial banks to household amounted to 51trillion Korean Won, which accounted for only 41% of that to the firms. However, the household loans outstanding, increasing over 40% per year for 4 years from 1999 to 2002, reached 300 trillion Won in the late 2005, which surpassed the 299 trillion Won of loans outstanding to the firms.

Figure 1.9 Herding in the overall loans market (LSV)



herding is followed. The result with the Chi-squared test is presented in Table 1.1. For herding for overall loans market (LSV_t), which is defined as the mean of herding measure for each loans category in time t (LSV_{it}), the evidence of herding can be found from 2006:1Q to 2008:2Q except in 2007:4Q. Also, the herding seems to be followed in the first half of 2008, 2009.and 2010. When it comes to the lending to SME, the evidence of herding is observed from 2006:1Q to the first half of 2007. In the first half of 2009 and the late 2010, there are evidences of herding, but they did not last long. The herding in the lending to the large firm occurred in 2006, when the decrease in loans outstanding by about 4 banks (=30% of 13 banks) was caused by herd behavior. In case of mortgage loan, there seems to be no strong statistical evidence of herd behavior.

With these results from KHI and LSV measure obtained using the same loans outstanding data by sector, we can get some findings. KHI and LSV does not necessarily give the consistent evidence of herding. That is probably due to the difference in the way how the indexes are calculated. However, it can be concluded that since 2000, a significant extent of herding was followed by Korean banks for lending to the overall lending

Table 1.1 LSV measures by loans sector

	Total loan			SME loan			Household loan		
	LSV_t		χ^2	LSV_{it}		χ^2	LSV_{it}		χ^2
2000.1Q	0.08	**	10.492	0.043		1.412	0.120	*	3.488
2Q	0.04		6.803	-0.034		0.259	0.120	*	3.488
3Q	-0.02		1.955	0.015		0.880	-0.062		0.098
4Q	0.07	**	12.557	-0.092		0.019	0.215	**	5.566
2001.1Q	0.05		7.429	0.046		1.238	0.199	**	4.952
2Q	0.22	***	26.788	0.181	**	4.665	0.258	***	7.485
3Q	0.17	***	19.500	0.131	*	3.250	0.208	**	5.778
4Q	0.11	***	15.202	-0.092		0.019	0.331	***	10.310
2002.1Q	0.12	***	14.182	0.120	*	3.488	0.120	*	3.488
2Q	0.11	**	12.615	0.076		2.077	0.153	**	4.333
3Q	0.15	***	17.538	0.153	**	4.333	0.153	**	4.333
4Q	0.20	***	22.100	0.125	*	2.925	0.279	***	8.125
2003.1Q	0.11	**	12.148	0.222	**	6.314	-0.009		0.546
2Q	0.12	***	14.182	0.120	*	3.488	0.120	*	3.488
3Q	0.19	***	21.268	0.187	**	5.270	0.187	**	5.270
4Q	0.15	***	21.327	-0.090		0.020	0.140	*	3.375
2004.1Q	0.07	*	9.351	0.145	*	3.692	-0.047		0.197
2Q	0.12	***	13.619	0.123	*	2.786	0.123	*	2.786
3Q	0.03		7.027	-0.082		0.023	0.110	*	2.834
4Q	0.09	**	12.350	0.125	*	2.925	0.279	***	8.125
2005.1Q	-0.07		0.650	-0.105		0.000	-0.029		0.325
2Q	0.10	**	11.103	-0.013		0.499	0.217	**	5.771
3Q	0.01		3.519	0.015		0.880	0.015		0.880
4Q	-0.04		1.661	0.030		1.071	-0.009		0.546

Note: ***, **, * represents the results in which the null hypothesis of no herding is rejected at 1%, 5% and 10% significance level respectively.

Table 1.1 (cont'd)

	Total loan			SME loan			Household loan		
	LSV_t		χ^2	LSV_{it}		χ^2	LSV_{it}		χ^2
2006.1Q	0.13	***	14.950	0.279	***	8.125	-0.029		0.325
2Q	0.12	***	16.654	0.085		2.124	0.162	**	4.163
3Q	0.15	***	14.945	0.145	*	3.692	0.145	*	3.692
4Q	0.13	***	19.158	0.169	**	4.789	0.092		2.444
2007.1Q	0.05	*	8.497	0.162	**	4.163	-0.069		0.085
2Q	0.04	*	8.647	0.120	*	3.488	-0.034		0.259
3Q	-0.01		3.467	0.063		1.733	-0.091		0.000
4Q	0.00		3.519	-0.062		0.098	0.092		2.444
2008.1Q	0.11	***	13.436	0.153	**	4.333	0.192	**	5.769
2Q	-0.03		1.486	-0.051		0.124	-0.051		0.124
3Q	-0.01		3.279	0.033		1.148	-0.082		0.023
4Q	-0.01		2.105	-0.015		0.487	-0.015		0.487
2009.1Q	0.08	**	12.615	0.233	**	6.231	0.233	**	6.231
2Q	0.11	***	16.030	0.092		2.444	0.015		0.880
3Q	0.08	**	10.750	-0.009		0.546	0.068		1.770
4Q	0.12	**	12.615	0.003		0.692	0.233	**	6.231
2010.1Q	-0.03		1.950	-0.105		0.000	-0.029		0.325
2Q	0.05	*	9.389	0.208	**	5.778	0.131	*	3.250
3Q	-0.06		0.391	-0.062		0.098	-0.062		0.098
4Q	0.09	***	13.659	0.179	**	4.493	0.294	***	8.806
2011.1Q	0.01		5.880	0.120		3.488	-0.072		0.029
2Q	0.01		4.301	0.015		0.880	0.092		2.444
3Q	0.14	***	19.769	0.033		1.148	0.110	*	2.834
4Q	0.05	*	8.450	0.202	**	5.200	0.125	*	2.925

Note: ***, **, * represents the results in which the null hypothesis of no herding is rejected at 1%, 5% and 10% significance level respectively.

market during 2002-2003, which is mainly attributable to severely intensified herding in the lending to household, possibly due to the information problem.caused by the deregulation. Since then, herding in the overall lending market and lending to SME is likely to have been intensified two more times around 2006 and 2008-2009. On the other hand, the herding measure in the lending to household dropped significantly after sever herding in early 2000s, and stayed below 0. In contrast to the anecdotal evidence, herding based on KHI and LSV measure does not seem to have been followed in the mortgage market during the sample period Herding tends to get most intensified during times when banks change their lending decisions in terms of scale of increase in loans outstanding. Those periods also tends to coincides with the peak and trough in the business cycles. That implies that banks follow herd behavior most when there is uncertainty about expectation for economic conditions.

The analysis so far is based on a simple mean of the KHI and LSV measure over 13 banks and 9 industries in each quarter of the sample period. There are, however, great discrepancies in loans outstanding by loans sector and bank as depicted in Figure 1.1 and Figure 1.10. Therefore, it might not be appropriate to use a simple mean of the KHI and LSV measure. To this end, I calculate a weighted mean of KHI and LSV measure each as follows;

$$Weighted\ KHI_{t,t+k} = \sum_{i=1}^{N} w_i \cdot KHI^i_{t,t+k} \tag{1.7}$$

$$Weighted\ LSV_t = \sum_{i=1}^{I} w_i \cdot LSV_{it} \tag{1.8}$$

where the weight for each i, Wi, is the loans outstanding to a individual bank i divided by total loans outstanding in each sector in time t for KHI, and the loans outstanding to a sector i divided by total loans outstanding for LSV measure.[17]

[17]Note that i denotes a bank in equation (1.5) for KHI and loans category in equation (1.1) for LSV.

Figure 1.10 Loans outstanding by each bank

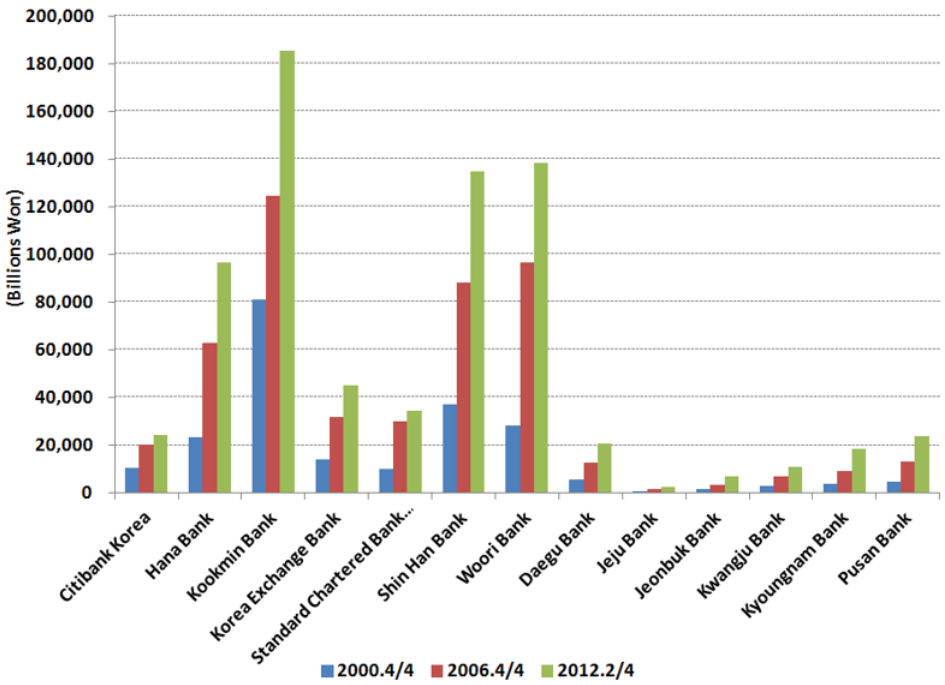


Figure 1.11 and 1.12 plots the weighted mean of KHI and LSV along with the simple mean measures. Comparing two measures for KHI in Panel A, we can confirm that qualitative results from simple mean measure still holds for the weighted mean measure. The general trend does not change even if we focus on the weighted mean measure. However, the weighted mean fluctuate to a greater extent than simple means. In particular, the weighted mean measure shows higher level of correlation during the periods when the herding is highly intensified, which implies that big banks follow the herding more intensively. It can be said that severe competition between a few big banks to expand loans in booming and/or contract loans increase in recession may cause financial instability and fluctuation of business cycle. When it comes to LSV measure, except a couple of periods, the weighted mean LSV measure is lower than the simple mean LSV during sample periods, which implies that herding in overall lending market is mainly attributable to the herding in the loans sectors that has relatively low portion of loans outstanding. However, in 2006:1Q, as herding intensity in lending to SME was very high while the measure for lending to other loans sector stayed low, the weighted mean LSV measure

Figure 1.11 Simple and weighted mean for overall loans market (KHI)

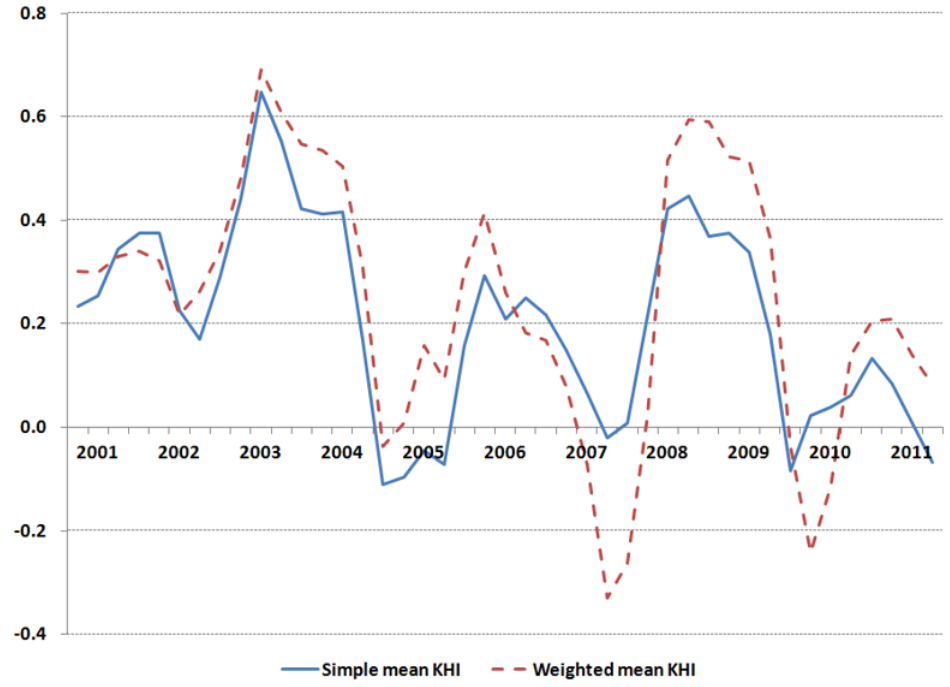


Figure 1.12 Simple and weighted mean for overall loans market (LSV)

shows higher level than the simple mean measure. In addition, comparing LSV to KHI in Figure 1.11 and 1.12, the time series pattern of weighted mean LSV looks more similar to that of KHI than the simple mean measure.

1.3.4 Rationality in Herding

In Section 3.3, I calculated two herding measures, KHI and LSV, and tried to detect the existence of herding in the Korean loans market using loans outstanding data by loans sector. Even if the KHI measure improved the previous ones including LSV with more theoretical conformity, it has limits to finding out irrational herd behavior where individual bank does not make lending decision based on its own information, but just follow other bank's decision. Here, following Uchida and Nakagawa (2007), I investigate more closely the rationality of the detected herding by calculating the adjusted LSV measure using Korean banks' loans outstanding data by industry. the adjusted LSV measure excludes the rational herding based on not only macroeconomic conditions, but also industry-specific factors.

The simple mean of the LSV measure obtained for 2003:4Q through 2012:2Q are represented in Table 1.2 and depicted in Figure 1.13. We can find that since 2005:3Q, time series pattern of herding is somewhat similar to one obtained using the loans data by sector, while, before that, it looks different from each other. It could be due to the fact that two LSV measures are calculated using different category of loans outstanding data. As Bikhchandani and Sharma (2000) pointed out, the LSV measure may not be a good measure unless the data category over which the measure is averaged are appropriately chosen. However, the empirical evidence about herding is observed in many of sample periods. In addition, note that, as mentioned in Section 3.1, LSV measures obtained here does not include banks' rational decision based on overall macroeconomic conditions.

Now, in equation (1.3), I use the following two industry-specific variables to further control for industry-specific rational factors. First, I use a variable representing the rela-

Table 1.2 Simple mean of LSV for overall loans market using data by industry (before adjustment)

	LSV_t		$\chi^2(9)$		LSV_t		$\chi^2(9)$
2003:4Q	0.069	***	26.185	2008:1Q	0.095	***	31.622
2004:1Q	0.048	**	18.147		-0.002		7.829
	0.008		9.019		0.052	**	18.051
	0.071	**	21.087		0.047	**	19.147
	0.105	***	36.169	2009:1Q	0.081	***	22.824
2005:1Q	0.054	*	16.571		0.032		12.717
	0.086	***	25.907		0.024		11.396
	0.015		11.398		0.121	***	32.637
	0.045	**	20.045	2010:1Q	-0.009		6.231
2006:1Q	0.028	**	16.967		0.037	*	15.016
	0.077	**	19.675		-0.005		8.691
	0.063	**	21.606		0.088	***	26.904
	0.048	**	20.769	2011:1Q	0.030		14.447
2007:1Q	0.005		13.897		0.033		14.268
	0.038	*	15.527		0.016		9.683
	0.001		7.358		0.043	**	17.804
	0.055	***	24.039	2012:1Q	0.077	***	23.324
					0.009		11.333

Note: ***, **, * represents the results in which the null hypothesis of no herding is rejected at 1%, 5% and 10% significance level respectively.

tive real GDP growth rate by industry for the eight industries except 'Household,' and the growth rate of real final consumption expenditure of household for 'Household.' These variables are to control for the relative profitability of each industry. The data are available from Report on National Accounts. Second, housing prices are used as a control variable. In Korea, housing is highly valued as collateral. I take the national housing price as an explanatory variable, which is available from Survey on National Housing Price by Kookmin Bank. I apply the price index only to three industries: Construction, Real Estate, and Household. I construct a variable which is a product of the rate of increase in index and dummy variable that takes the value of 1 for the three industries and 0 for the others.

Figure 1.13 Simple mean of LSV for overall loans market calculated using industry data

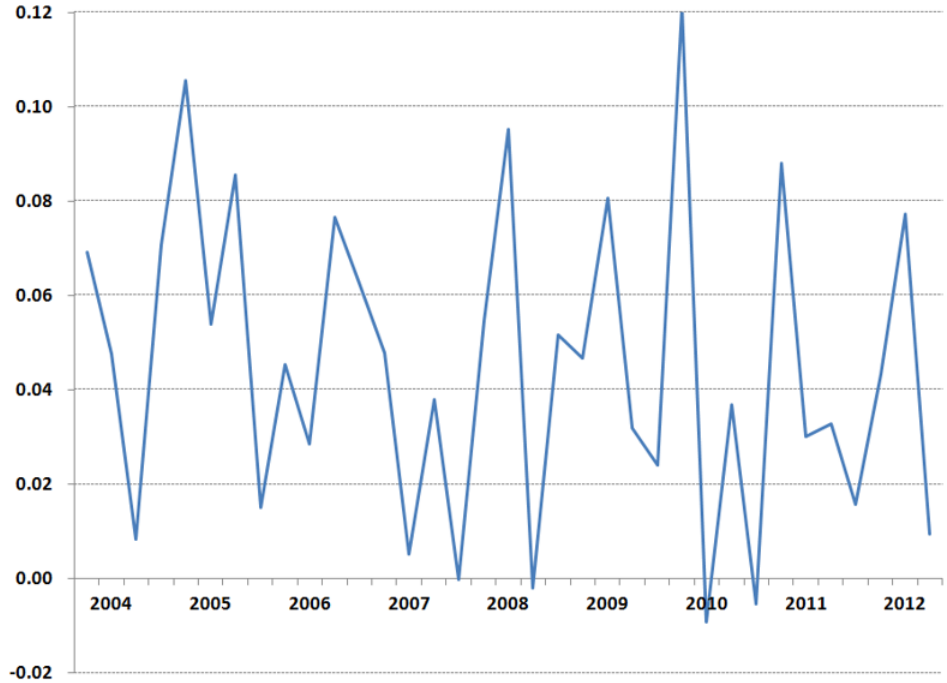


Table 1.3 presents the simple mean of herding measures adjusted for rational factors, and Figure 1.14 depicts the adjusted measures along with the unadjusted measures. We can find that even after adjustment for industry-specific rational herding, the evidence about herding still holds in almost same periods as before adjustment. The difference between solid and dotted lines represents the portion of herding which was adjusted by industry-specific rational factors. During most of the sample periods, few of herd behavior can be explained on rational grounds. It implies that purely irrational herding was dominant in Korean loans market.

1.4 Empirical Analysis of Factors that Affect Bank's Herding in Lending Markets

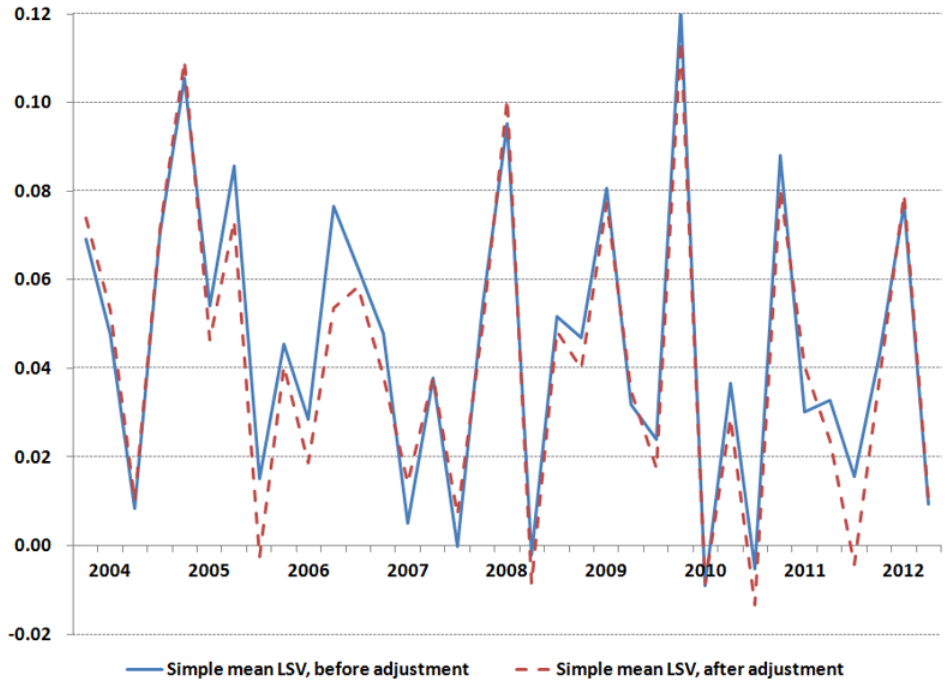
In the last section, I found evidence of herding in banks' lending decision to different loan categories. In this section, I investigate if the time series patterns of individual bank's

Table 1.3 Simple mean of LSV for overall loans market using data by industry (after adjustment for rational factors)

	LSV_t		$\chi^2(7)$		LSV_t		$\chi^2(7)$
2003:4Q	0.080	***	29.176	2008:1Q	0.087	***	30.000
2004:1Q	0.051	***	20.349		-0.018		6.474
	0.024		11.450		0.032	**	15.811
	0.080	***	23.279		0.038	***	19.339
	0.105	***	36.411	2009:1Q	0.093	***	23.080
2005:1Q	0.043	**	15.625		0.035	*	13.725
	0.063	***	20.017		0.025		11.715
	-0.008		8.188		0.132	***	35.425
	0.047	***	19.416	2010:1Q	-0.013		6.299
2006:1Q	0.010	*	13.746		0.012		11.410
	0.056	**	15.517		-0.020		5.778
	0.053	**	17.935		0.077	***	23.933
	0.031	***	19.436	2011:1Q	0.024	*	12.280
2007:1Q	0.024	**	15.674		0.021		11.969
	0.023	*	12.756		-0.005		7.096
	-0.005		6.274		0.053	***	18.932
	0.056	***	23.757	2012:1Q	0.080	***	24.273
					0.007		9.440

Note: ***, **, * represents the results in which the null hypothesis of no herding is rejected at 1%, 5% and 10% significance level respectively.

Figure 1.14 Simple mean of LSV for overall loans market before and after adjustment



herding measures are related with individual bank's characteristics and/or market structural and macroeconomic factors.

1.4.1 Measures and Variables

Following Kang (2010), we use non-interest income/total revenue and unsecured lending/total lending ratio, the BIS capital adequacy ratio as the characteristics of individual bank. Also, the ratio of M1/Lf, the spread between deposit interest rate and loan interest rate , the Herfindahl-Hirschman Index (HHI), and the gap between the CCI (Coincident Composite Index) and its benchmark value of 100 are used as the market structural and macroeconomic factors. The non-interest income/total revenue and unsecured lending/total lending ratio are proxy of information amount that each bank holds. Therefore, the lower those ratio, the lower possibility of herding. The BIS capital adequacy ratio is used to measure the extent to which banks emphasize their long-term profits. As the banks with low BIS capital ratio tend to pursue more on short-term profit, they are expected to follow herding more. As market structural and macroeconomic factors, The M1/Lf ratio is used as a proxy that measures the ratio of short-term liability to total liability. Thus, the higher this ratio, the more intense herding is expected. For the loan-deposit interest rate spread, the more intense the competition among banks to make loans is, the further the spread between deposit and lending interest rate narrows. As a consequence, it is expected that a increase (decrease) in the spread between deposit interest rate and loan interest rate will generate intensified (reduced) herding in bank lending. The HHI is added to measure the bank market concentration as a result of M&A between banks. The increase of the HHI is also expected to be accompanied by a rise in the herding index. Taking into account the business cycle where the economic agents' expectations change, the CCI gap is used as a independent variable. Considering that herding can be intensified when the business cycle fluctuates more sharply, herding is followed more intensely when the CCI gap widens.

Besides, as a robust check, I add the bank balance sheet - deposit ratio, and liquidity ratio - and income statement variables - return on assets (ROA), net interest margin (NIM), and the ratio of non-performing loans to total bank loans - to the baseline one at a time as independent variable, following Liu (2014). I use the fraction of assets funded with deposits as an indicator of the bank's ability to provide liquidity to borrowing firms. When deposit ratios are higher, banks may be more able to absorb shocks to the pricing of other liabilities and therefore change lending standards less frequently or more slowly. The banks' liquidity ratio, calculated as the ratio of the aggregated liquid assets to the total assets, is expected to show the negative relationship with the herding index, because when the deposit ratio is low, banks are less able to cover their loan losses or losses from other investments. The ROA and NIM, as a proxy for banks' overall profitability, are also expected to show a negative relationship with herding intensity, while the coefficient on the ratio of non-performing loans, as a measure of banks' expected loss from bad loans, is expected to be positive.

Lastly, dummy variables for banks under foreign management and time trend are included among explanatory variables to control the other factors. This is because banks under foreign management in Korea account for a large part of the Korean banking industry[18] and some point out that their management practices differ greatly from those of banks under domestic management. I add a time trend variable in order to control other changes in structural factors beside market structure and macro factors which could have effects on herding. The basic statistics of explanatory variables in this analysis are presented in Table 1.4.

[18]Banks managed by foreigners such as Korea Exchange Bank, Standard Chartered Bank, and CitiBank amount to 15.8% out of total loans held by all commercial banks on average during the sample period.

Table 1.4 The summary of statistics

	Explanatory Variables	Mean	Std. Dev
Information Capacity	Unsecured Loan/ Total Loan	0.4060	0.0779
	Unsecured SME Loan/ Total SME Loan	0.44680	0.0938
	Unsecured Household Loan/ Total Household Loan	0.3382	0.1033
	Non-interest Income Ratio	34.5653	22.6808
Long-term Profit Concern	BIS Capital Adquacy Ratio	11.9722	1.9485
Short-term Liquidity Ratio	M1/Lf	0.21340	0.0261
Intensity of Competition	Deposit Rate - Loan Rate	-1.9500	0.3382
	Deposit Rate - SME Loan Rate	-1.9604	0.4516
	Deposit Rate - Household Loan Rate	-2.0938	0.4606
Market Concentration	HHI	0.1513	0.0067
Business Fluctuation	Absolute value of (Coincident Composite Index - 100)	1.0813	0.8390

1.4.2 Estimation

The empirical analysis is conducted based on the period between 2000:1Q and 2011:4Q.[19] and the quarterly data are used for the analysis. For the dependent variable, the KHI for total lending, lending to SME and lending to household are used herding in lending to SME and household could be more likely to result in bank insolvency. As dependent variables, I use $KHI^i_{t,t+7}$ representing the average herding intensities of individual banks' total lending, lending to SME and lending to household during the eight quarters since period t. The panel analysis estimation equation is as follows:

$$KHI^i_{t,t+7} = \alpha^i + \beta X^i_t + \gamma I_t + \epsilon^i_t \,, \tag{1.9}$$

where $KHI^i_{t,t+7}$ denotes herding intensity of bank i during the 8 quarters between t

[19] As dependent variables are the average intensity of herding during 8 quarters beginning period t, the herding intensity between the first quarter of 2010 and the fourth quarter of 2011 becomes the last dependent variables. Therefore, the numbers of dependent variables used in empirical analysis become 533 (13 commercial banks *41 quarters)

and $t+7$, α^i dummy variables of individual banks, X_t^i characteristic vector of bank i at period t, I_t time series variable vector, and β and γ coefficient vectors.

1.4.3 Results

The estimation results for herding intensity for the total lending are presented in Table 1.5. It demonstrates that the only 'unsecured lending/total lending' variable is significant among the characteristics of banks. It also reveals that, among time series variables, the 'deposit interest rate - loan interest rate differential' and the lending market HHI are all significant and that the signs of the estimated coefficients are consistent with the expectations. The result seems that many of the coefficient of explanatory variables are not significant. However, it does not necessarily imply that these variables will not affect the herding intensity of individual lending markets such as lending to SME or household. This is because the effect the explanatory variables have on lending to one sector could differ from that on lending to other sectors. Even if herding does not arise in total lending, herding in lending could bring about excessive flow of funds into or out of a specific sector, which causes side effects such as growing loss of banks or fluctuation in asset prices. Looking into the estimation results in detail, the coefficient of 'deposit interest rate - average lending interest rate differential' have significant positive values, and this implies that, when competition among banks becomes fierce, the herd behavior of banks could be intensified. Given that coefficient of lending market HHI is estimated to be a significant value, it is found that the herding intensity of banks deepens in a case the market is highly concentrated by reduced numbers of banks due to consolidation among banks. However, the variables representing the fluctuation of business cycle, are not significant, showing that there is no empirical evidence that the herding of bank's total lending has correlation with business cycle.

The results of empirical analysis of the herding intensity of lending to SME and household are displayed in Table 1.6 and Table 1.7 respectively. In contrast to the estimation

Table 1.5 Estimation results of herding intensity in overall loans market

	Total Loan		
	Coeff.	Std. Error	
Unsecured Loan Ratio	0.65674	0.2735	**
Non-interest Income Ratio	0.00005	0.00138	
BIS Capital Adquacy Ratio	0.015	0.0132	
Foreign Bank Dummy	-0.01102	0.1168	
M1/Lf	0.69186	1.284	
Deposit Rate - Loan Rate	0.141	0.08724	*
HHI	25.10722	7.02556	***
Business Fluctuation	0.00196	0.02186	
Time Trend	0.0161	0.01939	
Observation	533		
$\bar{R}^2$	0.1254		

of total lending, for the estimation of lending to SME, I use the 'unsecured lending to SME/total lending' variables as a proxy for capacity to produce information, and the 'deposit interest rate - SME loan interest rate differential' as a time series variable of the interest rate differential representing the intensity of competition among banks in the SME loan market. Similarly, I use the 'unsecured lending to household/total lending' variables, and the 'deposit interest rate - household loan interest rate differential' as a time series variable when herding intensity for household loan market is used as dependant variable.

I compare the estimation results which use the herding intensity of lending to SMEs with those using the herding intensity of lending to household as a dependant variable. Among explanatory variables representing the capacity to produce information, the estimated coefficient of unsecured lending ratio appears significantly negative when the herding intensity of lending to households is used as a dependent variable (Table 1.7), while it is insignificant when the herding intensity of lending to SME is used as a dependent variable (Table 1.6). This is because the extent to which the proportion of unsecured lending reflects the capacity to produce information can differ between lending to household and SME. For instance, as mortgage lending to household against the collateral value

Table 1.6 Estimation results of herding intensity in lending to SME

Dep. Var	SME Loan		
	Coeff.	Std. Error	
Unsecured Loan Ratio	-0.20241	0.26501	
Non-interest Income Ratio	-0.00165	0.00131	
BIS Capital Adquacy Ratio	-0.04418	0.01188	***
Foreign Bank Dummy	0.30424	0.11061	***
M1/Lf	4.176344	1.70277	**
Deposit Rate - Loan Rate	0.07222	0.09434	
HHI	-9.86089	6.82077	
Business Fluctuation	0.05285	0.021184	**
Time Trend	-0.001298	0.02679	
Observation	533		
$\bar{R}^2$	0.1692		

Table 1.7 Estimation results of herding intensity in lending to household

	Household Loan		
	Coeff.	Std. Error	
Unsecured Loan Ratio	-1.27022	0.18934	***
Non-interest Income Ratio	0.00218	0.00123	*
BIS Capital Adquacy Ratio	0.02281	0.01167	*
Foreign Bank Dummy	-0.01136	0.10432	
M1/Lf	0.42781	0.7666	
Deposit Rate - Loan Rate	0.28682	0.04692	***
HHI	37.58737	4.85783	***
Business Fluctuation	0.00503	0.01943	
Time Trend	-0.04136	0.01334	***
Observation	533		
$\bar{R}^2$	0.3878		

of housing, is highly liquid so that banks in Korea can easily foreclose on the mortgage and seize the collateral to retrieve their funds. However, the value of production facilities or factory sites, which are mortgage collateral for lending to SME, not only declines sharply in line with the deteriorated operating performance of the corresponding firms, but also assets are also less liquid, which makes it difficult to overcome the problem of information insufficiency by securing such SME loans. For these reasons, it is highly likely that the proportion of unsecured lending to household is closely linked to banks' capacity to produce information. However, while it is relatively less likely that the ratio of unsecured lending to SME is closely linked with banks' capacity to produce information. Therefore, the effect of the proportion of unsecured lending on herding intensity is highly likely to become more obvious in lending to households rather than in lending to SME.

For the proportion of non-interest income, the estimated coefficient is significant when the herding intensity of lending to household is used as a dependent variable, However, it is insignificant when the herding intensity of lending to SME is used as a dependent variable. Among the types of non-interest income used as explanatory variables, the commission incomes and other operating profit are included. And commission income gained usually through retail banking and transactions with households accounts for a relatively low proportion of non-interest income. Therefore, it can be assumed that the larger proportion of non-interest income (the lower the proportion of interest income), the lower weight of retail banking and household related business and the larger proportion of corporate business. This implies that although a larger weight of non-interest income may weaken a bank's capacity to produce information related to household, it may not weaken the one related to SME. It follows that it is possible that the estimated coefficient of the proportion of non-interest income may be significant for lending to household whereas it is insignificant for lending to SME.

Second, when we use the capital adequacy ratio as an explanatory variable, the signs of estimated coefficients in lending to SME are negative as expected and its significance is

also high. High capital adequacy ratios could result in low herding intensity as incentives arise to manage banks from a long-term perspective. This seems to stem from the fact that banks which pursue the long-term profit by placing their priority on management stability tend to show less herd behavior in their lending to SME than in their lending to household. In practice, the risk of delinquency in lending to SME is higher than that in lending to households.[20]

Third, when the dummy variable for commercial banks managed by foreigners is used as an explanatory variable, the estimated coefficient is not significant where the herding intensity of lending to household is used as the dependent variable. However, it exhibits a significant positive value when the herding intensity of lending to SME is used as a dependent variable. This can be interpreted that banks under foreign management are more likely to herd in the market of lending to SME, as they have insufficient information on the domestic market.

Although the results for the regression as a robust check are not reported in the tables, the liquidity ratio and ROA shows a significant relationship with the individual bank's herding index, especially for the case where the herding for the lending to SME is used as a dependent variable. It implies that the bank's herding intensity is more subject to the bank's financial health or profitability in the SME lending market, rather than in the household loans market.

Next, I examine the estimated coefficients of market structure and macroeconomic variables. First, M1/Lf ratio is shown to have a significant positive value in the estimation of herding of the lending to SME. This implies that when controlling for other variables, the increase in short-term liquidity has an effect on more intensified herding

[20]The delinquency rate of loans to SME remains higher than that of loans to household on a basis of Korean commercial bank lending. The gap of delinquency rates between lending to firms (large firms + SME) and household recorded average 0.8%p between the second quarter of 2003 and the fourth quarter of 2011. Notably it has expanded to 1.6%p during the first and second quarter of 2009 when the credit crunch was severely raging. Considering that the delinquency rate of SME is usually much larger than that of the large firms, the gap of delinquency rates between lending to SME and household would be larger.

of the lending to SME. However, it is not significant when the herding of the lending for household is used as a dependant variable.

Second, I examine the estimated coefficient of the explanatory variable of deposit interest rate - loan interest rate differential which reflects the intensity of competition among banks. When lending to SME is used as a dependent variable, the coefficient is positive as expected, but not significant. In the case where lending to household is used as a dependent variable, the coefficient has a significant positive value. It indicates that the more fierce competition to make loans intensifies the herding in the household lending market.

Third, the estimated coefficient of HHI representing the degree of market concentration, has a significant positive value when the lending to total household are used as dependent variables. However, it has a insignificant value in the case the lending to SME is used as a dependent variable. The transactional lending which banks deal with in a standardized method by using publicly available information, is mostly small sized lending to household. Therefore, the significant increase in transactional lending in line with consolidation of banks is highly likely to occur in the lending to household.

Fourth, I look into the estimated coefficient of explanatory variable of the CCI gap, which represents the size of business fluctuation. When the herding intensity of lending to SME is used as a dependent variable, the coefficient of the corresponding explanatory variables has a significant positive value. This implies the herding of lending to SME is getting intensified as the economic booming or recess deepens. As lending to SME tends to respond more sensitively to economic condition than household loans, it is expected that the herding would be most intensified around the peak or trough of business cycle. However, the estimated coefficient of the size of business fluctuation is not significant in the case the lending to household is used as dependent variable.

Finally, the estimated coefficient of time trend in the estimation of household loan is significantly negative, which suggests that intensity of herding for household loan lessens over time. It is consistent with our finding in the last section.

1.5 Conclusion

This study measures the herding intensity of banks' herding for some particular loan categories as well as the overall lending decision in the Korean loan market, using two herding indexes: LSV which is a standard in the existing literatures and KHI which is more recent one and allows us to obtain the herding index of individual agents. With herding measures calculated using loans outstanding data by sector, this paper looks at the time series pattern of measures to examine the change in banks' lending behavior over the sample period and find empirical evidence about existence of herding for lending to a specific sector by comparing the results from KHI and LSV. After that, using the loans data by industry, I calculate LSV herding measures before and after adjustment to further investigate the rationality of herding. Additionally, using KHI, this study conducted an empirical analysis about the causes of herding in bank lending based on Korean bank panel data.

KHI and LSV does not necessarily give the consistent evidence of herding. That is probably due to the difference in the way how the indexes are calculated. However, it can be concluded that since 2000, a significant extent of herding was followed by Korean banks for lending to the overall lending market during 2002-2003, which is mainly attributable to severely intensified herding in the lending to household, possibly due to the information problem.caused by the deregulation. Since then, herding in the overall lending market and lending to SME is likely to have been intensified two more times around 2006 and 2008-2009. On the other hand, the herding measure in the lending to household dropped significantly after sever herding in early 2000s, and stayed below 0. In contrast to the anecdotal evidence, herding does not seem to have been followed by Korean banks in the mortgage market during the sample period. Also, Herding tends to get most intensified during times when banks change their lending decisions in terms of scale of increase in loans outstanding under the increased uncertainty about expectation

for economic conditions.

An empirical analysis was conducted into the factors causing the herd behavior of banks. The results may be summarized as follows. In terms of macroeconomic factors, when lending market is concentrated and or competition among banks becomes fiercer, herding in total lending and lending to households becomes further intensified. However, it seems that herding in lending to SME is further intensified when funds inflow into short-term financial products and greatly intensified when the business cycle is close to a trough or a peak. Also, controlling for other factors, intensity of herding for lending to household decreased during the sample period. Among bank characteristic variables, an increase in the unsecured loan ratio representing the capacity to produce information results largely in intensified herding in household lending and total loan lending. It is likely that herding for SME and household is more intensified when bank pursues the short-term profit. Meanwhile, the bank under foreign management follows herd behavior in the lending market to SME.

REFERENCES

REFERENCES

Acharya, V. V. and T. Yorulmazer: 2007, 'Too many to fail? An analysis of time-inconsistency in bank closure policies'. *Journal of financial intermediation* **16**(1), 1–31.

Banerjee, A. V.: 1992, 'A simple model of herd behavior'. *The Quarterly Journal of Economics* pp. 797–817.

Barron, J. M. and N. T. Valev: 2000, 'International lending by US banks'. *Journal of Money, Credit and Banking* pp. 357–381.

Bikhchandani, S., D. Hirshleifer, and I. Welch: 1992, 'A theory of fads, fashion, custom, and cultural change as informational cascades'. *Journal of political Economy* pp. 992–1026.

Bikhchandani, S. and S. Sharma: 2000, 'Herd behavior in financial markets'. *IMF Economic Review* **47**(3), 279–310.

Borio, C., C. Furfine, P. Lowe, et al.: 2001, 'Procyclicality of the financial system and financial stability: issues and policy options'. *BIS papers* **1**, 1–57.

Choe, H., B.-C. Kho, and R. M. Stulz: 1999, 'Do foreign investors destabilize stock markets? The Korean experience in 1997'. *Journal of Financial Economics* **54**(2), 227–264.

Devenow, A. and I. Welch: 1996, 'Rational herding in financial economics'. *European Economic Review* **40**(3), 603–615.

Freixas, X.: 2010, 'Post-crisis challenges to bank regulation'. *Economic Policy* **25**(62), 375–399.

Graham, J. R.: 1999, 'Herding among investment newsletters: Theory and evidence'. *The Journal of Finance* **54**(1), 237–268.

Grinblatt, M., S. Titman, and R. Wermers: 1995, 'Momentum investment strategies, portfolio performance, and herding: A study of mutual fund behavior'. *The American economic review* pp. 1088–1105.

Hirshleifer, D. and S. Hong Teoh: 2003, 'Herd behaviour and cascading in capital markets: A review and synthesis'. *European Financial Management* **9**(1), 25–66.

Jain, A. K. and S. Gupta: 1987, 'Some evidence on herding behavior of US banks'. *Journal of Money, Credit and Banking* **19**(1), 78–89.

Kang, J.-K.: 2010, 'Eunghaengdaechuleui ssolimhyeonsange gwanhan siljeungbunseok'. *Economic Analysis* **16**(1), 1–35.

Lakonishok, J., A. Shleifer, and R. W. Vishny: 1992, 'The impact of institutional trading on stock prices'. *Journal of financial economics* **32**(1), 23–43.

Liu, C.: 2014, 'Herding behavior in bank lending: Evidence from us commercial banks'. *Available at SSRN 1917552*.

Nakagawa, R.: 2008, 'Herd behavior by Japanese banks in local financial markets'.

Nakagawa, R., H. Oiwa, and F. Takeda: 2012, 'The economic impact of herd behavior in the Japanese loan market'. *Pacific-Basin Finance Journal* **20**(4), 600–613.

Nakagawa, R. and H. Uchida: 2011, 'Herd behaviour by Japanese banks after financial deregulation'. *Economica* **78**(312), 618–636.

Rajan, R. G.: 1994, 'Why bank credit policies fluctuate: A theory and some evidence'. *The Quarterly Journal of Economics* pp. 399–441.

Scharfstein, D. S. and J. C. Stein: 1990, 'Herd behavior and investment'. *The American Economic Review* pp. 465–479.

Sias, R. W.: 2004, 'Institutional herding'. *Review of financial studies* **17**(1), 165–206.

Uchida, H. and R. Nakagawa: 2007, 'Herd behavior in the Japanese loan market: Evidence from bank panel data'. *Journal of Financial Intermediation* **16**(4), 555–583.

Wermers, R.: 1994, 'Herding, trade reversals, and cascading by institutional investors'. *Available at SSRN 5644*.

Wermers, R.: 1999, 'Mutual fund herding and the impact on stock prices'. *The Journal of Finance* **54**(2), 581–622.

Wylie, S.: 2005, 'Fund manager herding: A test of the accuracy of empirical results using UK data'. *The Journal of Business* **78**(1), 381–403.

CHAPTER 2

The Extensive Margin Effects of Bank Health, Credit Shock on the Firm's Export and the Role of Corporate Governance

2.1 Introduction

It is known that the financial health of banks that provides finance to the firm is an important determinant of firm-level exports (Amiti and Weinstein (2011)). In this chapter, I investigate whether the bank health and the credit shock to the bank affects its client firm's export and whether more concentrated ownership structure for the firm makes its export activities resilient or not.

2.2 Data and Estimation

In this section, I provide details on the data and measurement of the variables. For the analysis, I use three main datasets: firm-level data for Korean firms, bank-level data on Korean banks, and matched bank-firm loans data.

2.2.1 Data Source

The source of firm-level data is the KISVALUE and KISLINE database, the business information source of Korean credit rating company, Korean Investors Service (KIS). This dataset provides information on wide range of firm characteristics and financial statements not only on the publicly traded firms but also on the privately held firms that are

subject to external audit in Korea[1]. They are all required to report annually their audit statement including financial statements to the financial authorities. The sample firm covers all industries except the financial and insurance industries to avoid endogeneity problem. In general, the Korean fiscal year runs from January to December and more than 90 percent of the firms reports their financial statement including loans data for the fiscal year ending in December. For this analysis, the firms whose fiscal year ends in other than December are excluded from the sample for consistency.

The bank-level data comes from the Financial Statistics Information System (FISIS) database maintained by the Financial Supervisory Service, Korea's integrated supervisory authority. The FISIS contains extensive range of information on financial institutions including financial statements and soundness indicators. My definition of a bank, in this paper, covers Korean nationalwide, regional and special bank[2]. The foreign banks branches are excluded because the share of the loans to the firms is very low and relatively small number of firms borrow from the foreign banks.

I use the matched bank-firm loans data from Data Analysis, Retrieval and Transfer (DART) System, the Korean electronic disclosure system. DART provides loans data for each firm that is subject to external audit in the annotation part of the annual statement of audit. The matched bank-firm data basically contains the total amount of the short-term and long-term loans respectively at the end of year and the name of every bank from which the firm borrows. I collected loans information by hand by searching the statement of audit for each firm for 2012 and 2013. Some of firms borrowing from the multiple banks

[1]According to the Article 2 of the Act on External Audit of Stock Companies and the Article 2 of Enforcement of Decree, a stock company falling under any of the following shall be subject to accounting audit conducted by an external auditor; 1. A stock company whose total assets as of the end of the immediately preceding business year amount to no less than ten billion won, 2. A stock-listed corporation or a stock company that intends to become a listed corporation during the pertinent business year or the following year, 3. A sock company whose total liabilities and total assets amounts to no less than seven billion won respectively as of the end of the immediately preceding business year, 4. A stock company whose number of employees exceeds 300 as of the end of the immediately preceding business year and whose total assets amount to no less than seven billion won.

[2]During the sample periods, 2010 to 2013, there were seven nationalwide commercial banks, six regional banks, and five special banks in Korea.

reports the name of only a part of the bank[3]. These firms are excluded from the sample as every bank that has the loans outstanding to the firm can not be identified. Also, I include only firms that report their loan information in both years.

2.2.2 Measurement

To capture the effect of the banks' financial health and the credit shock to the bank on the export activity for each firm, I need to identify which bank(s) with which a firm has relationship could potentially affect the firm's activity. First, I focus on the firm's main bank only. In a bank-centered financial system like Korea, firms obtain most of their external financing from their main banks, although they maintain banking relationships with several banks (Bae et al. (2002)). The main bank for each firm, for our analysis, is defined as the bank that has the most loans outstanding to the firm at the end of year 2012 and 2013. The matched bank-firm loans data allows me to identify the main bank for each firm. Considering the fact that the firm maintains continuing relationship with its main bank for the extended time, it is assumed here that the firm had the same main bank in the first half of the sample period year, 2010 and 2011, when there is no matched bank-firm loans data available yet. Second, as more and more firms borrow from several banks rather than from its main bank only, the chances are that a firm's activity may be affected not only by the financial health of its main bank, but also by that of other banks from which it borrows. To capture this, I also use the other measure that is a weighted average of credit, where the weights are the share of bank loans. I compute the share of bank loans for every bank from which a firm borrows in 2012 and 2013, and take the average of them as the weights.

Also, one other complication regarding the study of bank-firm relationship is merger in banking industry because it makes harder to match banks and firms. Fortunately, however, there was no merge between Korean domestic banks between 2010 and 2013.

[3]Usually, a large firm which borrows a large amount from multiple banks tends to report only one representative bank name.

The bank health and the credit shock to the bank is measured as the ratio of the bank capital to the assets, capital adequacy ratio, non-performing loans ratio, return on asset (ROA), and return on equity (ROE) for each bank.

Following Joh (2003) who shows that the controlling family's ownership concentration can serve as a better control-ownership disparity measure for the Korean firm data, I measure the ownership concentration to examine the corporate governance effects. The KISLINE provides the ownership data such as the names and shareholdings of the largest shareholder and its specially related persons including family members. In this paper, the measure of ownership concentration is computed as the sum of shareholdings of the largest individual shareholder and his/her family members at the end of year 2010 to 2013. The firm whose largest shareholder is a corporation or an organization, not a private individual, is excluded as the family relationship cannot be identified. The ownership concentration for the sample firms in this paper is 58.9%. This figure is higher than what is found by Joh (2003), presumably as many of the large firms - typically publicly traded and/or affiliated with the business group - are excluded in the process of collecting the matched bank-firm loans data. Ownership concentration in publicly traded firms is lower than in privately held firms, and that of firms affiliated with business group is lower than that in independent firms (Joh (2003)).

The KISVALUE dataset provides us with the domestic and foreign sales as well as total sales. I sum up the domestic and foreign sales and compare it with the total sales in order to check validity of reported export data and to distinguish the firm with zero foreign sales from the one whose export data are missing. Only the firm-year observations whose domestic and foreign sales data add up to the total sales are included in the sample.

It is well known that exporters are bigger, more capital intensive, and more productive than non-exporters (Bernard and Jensen (2004)). Thus, I add the firm characteristics as control variables. I measure firm size by the fixed assets and the number of employee, capital intensity by capital-labor ratio which is defined as the fixed asset over direct labor,

labor productivity by value added per worker or net sales per worker. I also add firm age, which is time varying, using information on the date of establishment of the firm from KISVALUE dataset. Furthermore, I include the following dummy variables: (i) industry dummies for four-digit industry level to control for unobserved industry-fixed effects, (ii) year dummies to control for unobserved macroeconomic effects.

2.2.3 Model

Our basic estimating equation is:

$$\begin{aligned} expdum_t &= \alpha \cdot Ownership_{t-1} + \beta \cdot Credit_{t-1} + \gamma \cdot Ownership_{t-1} \times Credit_{t-1} \\ &\quad + Z_{t-1} \cdot \delta + D_i + D_t + \epsilon_{i,t}, \end{aligned} \tag{2.1}$$

where $expdum_t$ is an indicator variable that takes the value of 1 if the firm's exports is greater than zero at time t, $Ownership_{t-1}$ is the ownership concentration measure that is computed as the sum of shareholdings of the largest individual shareholder and his/her family members at time $t-1$, $Credit_{t-1}$ is the bank's financial health[4] at time $t-1$, Z_{t-1} is a vector of logged value of firm characteristics at time $t-1$, and D_i and D_t is industry and year dummy respectively. For $Credit_{t-1}$, as it may take more than one year for the bank health and the credit shock to the bank to affect the firm's exports activity, I add two year lagged variable and the average of measure of one year and two years lagged measure as a robust test. Also, $Ownership_{t-1}$ and $Credit_{t-1}$ were demeaned before the interaction. Demeaning those variables implies that the coefficient on $Ownership_{t-1}$ or $Credit_{t-1}$ is equal to the average partial effect for $Ownership_{t-1}$ or $Credit_{t-1}$.

Ultimately, I investigate whether a firm's future exports performance is affected by the bank's financial health and/or the credit shock to the bank, and whether the firm's more

[4]If I take the change in $Credit_{b,t-1}$, that is $(\triangle Credit_{b,t-1})$, it can be interpreted as a credit shock to the bank from which a firm borrows.

family-concentrated ownership structure makes its exports more resilient or not. For that purpose, I use the ownership concentration, the firm characteristics, and the bank health as the lagged variables as a baseline. So, the coefficients β and γ are of my main interest.

I run the regression based on the following three assumptions as to which bank's health or credit shock affects the firm's exports activity; (i) only the main bank for each firm affects the likelihood that a firm exports (column (1)), (ii) the health or the credit shock for all the banks from which a firm borrows may have the extensive margin effects on the frim exports (column (2)), and (iii) the main bank's health or credit shock has its own impact, but the other banks in relation with a firm may have the effect on the firm's export as well (column (3)). So, I separate the total credit into credit from the main bank ($Credit\_main_{t-1}$) and weighted average of the credit from all other banks ($Credit\_others_{t-1}$). And I also add interaction terms between $Ownership_{t-1}$ and $Credit\_main_{t-1}$ and between $Ownership_{t-1}$ and $Credit\_others_{t-1}$. The assumption (iii) stands somewhere between two extreme ones; I focus on the main bank only in (i), while the health or credit shocks of all the banks from which a firm borrows potentially affects the firm exports in proportion to the share of loans in (ii).

2.3 Regression Results

2.3.1 The Lagged Level of the Credit

I examine the extensive margin effects of the lagged level of bank's *Credit* as a proxy of bank's health in Table 2.1 through 2.4. As a baseline model, table 2.1 shows the results for the regression for the extensive margin effects with one year lagged level of credit variables ($Credit_{t-1}$). Among the firm characteristic variables, the coefficient on the number of employee, one of the proxy for the firm size, is statistically significant over all specification. It implies that the bigger size of the firm, the more likely the firm is to export. Also,

the coefficient on the firm age shows a positive relationship for sone measures of credit.

From the $Credit_{t-1}$ variable, we can see that the healthier the banks from which a firm borrows, the firm is more likely to export. It is true whether we look at the firm's main bank or we assume that all the creditor banks matter. The interaction between $Ownership_{t-1}$ and $Credit_{t-1}$ is positive and significant for most of credit measures: the likelihood that the firm enter the export activity increases at higher rate for the firm with higher family ownership concentration. It indicates that the corporate governance where the family members hold more shares helps the firm's export activity more resilient when the negative credit shock occurs to the firm.

When looking at the effects by separating the credits by main bank from other banks, the coefficient on both $Credit_{t-1}$ and its interaction with $Ownership_{t-1}$ is more significant for the main bank than for other banks: the firm's export is affected more by the health of its main bank rather than by other banks with which it has relationship.

The only difference of Table 2.2 is that the lag of *Credit* variable is now two years. It assumes that the health of banks affects the exports activity for the firm in two years. The overall results for Table 2.2 is the same, but the magnitude of the coefficients on $Credit_{t-2}$ and interaction term tends to be larger than in Table 2.1.

In Table 2.3, I included both one year and two year lagged *Credit* variables at the same time. We can see that the sign of some of the $Credit_{t-2}$ and interaction term changes into the negative and the significant relationship disappears in most cases, while the number of employee keeps significant positive relation.

Finally, Table 2.4 shows the results for the regression where I use the average of *Credit* variable that lags one year and two years. The main results still holds when it is assumed that the average financial health for the banks affects the firm's export.

Table 2.1 Export dummy and lagged level of the credit (lag by 1 year)

	(1) Credit by main banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0535	-0.0485	-0.0334	-0.0376	-0.0541*
	(0.0327)	(0.0326)	(0.0326)	(0.0327)	(0.0327)
$Credit_{t-1}$	0.0076***	0.0056***	0.0362	0.0024	0.0758**
	(0.0026)	(0.0019)	(0.0232)	(0.0022)	(0.0296)
$Ownership_{t-1} * Credit_{t-1}$	0.0222***	0.0121***	0.0054	0.0075	0.2590***
	(0.0063)	(0.0043)	(0.0562)	(0.0054)	(0.0723)
$\ln(Fixed\ assets_{t-1})$	0.0285	0.0293	0.0329	0.0338	0.0316
	(0.0211)	(0.0211)	(0.0211)	(0.0211)	(0.0211)
$\ln(Employee_{t-1})$	0.0773***	0.0804***	0.0770***	0.0771***	0.0782***
	(0.0204)	(0.0204)	(0.0205)	(0.0204)	(0.0203)
$\ln(Firm\ age_{t-1})$	0.0366*	0.0360*	0.0306	0.0302	0.0335*
	(0.0204)	(0.0204)	(0.0205)	(0.0204)	(0.0203)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0013	-0.0004	-0.0028	-0.0006	0.0020
	(0.0187)	(0.0187)	(0.0187)	(0.0187)	(0.0187)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0007	0.0008	0.0081	0.0071	0.0078
	(0.0181)	(0.0181)	(0.0181)	(0.0182)	(0.0181)
Constant	-0.596***	-0.665***	-0.618***	-0.593***	-0.608***
	(0.1950)	(0.1960)	(0.1970)	(0.1960)	(0.1950)
Observation	2,282	2,282	2,282	2,282	2,282
R^2	0.360	0.359	0.356	0.356	0.360

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.1 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0663**	-0.0530	-0.0349	-0.0427	-0.0574*
	(0.0332)	(0.0330)	(0.0328)	(0.0330)	(0.0330)
$Credit_{t-1}$	0.0113***	0.0063***	0.0471*	0.0068**	0.1190***
	(0.0034)	(0.0022)	(0.0285)	(0.0028)	(0.0388)
$Ownership_{t-1} * Credit_{t-1}$	0.0319***	0.0123**	-0.0111	0.0034	0.2390**
	(0.0087)	(0.0056)	(0.0728)	(0.0072)	(0.0975)
$\ln(Fixed\ assets_{t-1})$	0.0265	0.0297	0.0330	0.0344	0.0315
	(0.0211)	(0.0211)	(0.0211)	(0.0211)	(0.0211)
$\ln(Employee_{t-1})$	0.0782***	0.0804***	0.0782***	0.0794***	0.0790***
	(0.0204)	(0.0205)	(0.0205)	(0.0206)	(0.0205)
$\ln(Firm\ age_{t-1})$	0.0397*	0.0379*	0.0312	0.0314	0.0351*
	(0.0204)	(0.0205)	(0.0205)	(0.0204)	(0.0203)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0008	-0.0030	-0.0043	-0.0047	-0.0021
	(0.0187)	(0.0188)	(0.0188)	(0.0188)	(0.0187)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0093	0.0098	0.0099	0.0117	0.0104
	(0.0181)	(0.0182)	(0.0182)	(0.0183)	(0.0182)
Constant	-0.608***	-0.664***	-0.630***	-0.612***	-0.619***
	(0.1940)	(0.1970)	(0.1980)	(0.1960)	(0.1950)
Observation	2,282	2,282	2,282	2,282	2,282
R^2	0.362	0.359	0.356	0.357	0.360

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.1 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0684**	-0.0555*	-0.0419	-0.0519	-0.0624*
	(0.0332)	(0.0331)	(0.0330)	(0.0332)	(0.0332)
$Credit\_main_{t-1}$	0.0062**	0.0053***	0.0368	0.0011	0.0597*
	(0.0028)	(0.0020)	(0.0249)	(0.0022)	(0.0305)
$Ownership_{t-1} * Credit\_main_{t-1}$	0.0185***	0.0097**	-0.0374	0.0058	0.2470***
	(0.0068)	(0.0048)	(0.0619)	(0.0057)	(0.0766)
$Credit\_other_{t-1}$	0.0052*	0.00058	-0.0006	0.0068***	0.0686**
	(0.0028)	(0.0018)	(0.0239)	(0.0025)	(0.0331)
$Ownership_{t-1} * Credit\_other_{t-1}$	0.0124	0.0057	0.1130*	0.0065	0.0245
	(0.0080)	(0.0050)	(0.0680)	(0.0069)	(0.0921)
$\ln(Fixed\ assets_{t-1})$	0.0249	0.0289	0.0329	0.0295	0.0281
	(0.0212)	(0.0212)	(0.0212)	(0.0211)	(0.0211)
$\ln(Employee_{t-1})$	0.0772***	0.0796***	0.0763***	0.0785***	0.0795***
	(0.0205)	(0.0205)	(0.0205)	(0.0205)	(0.0205)
$\ln(Firm\ age_{t-1})$	0.0395*	0.0379*	0.0330	0.0354*	0.0361*
	(0.0204)	(0.0205)	(0.0205)	(0.0204)	(0.0204)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0021	-0.0003	-0.0026	-0.0012	0.0020
	(0.0187)	(0.0187)	(0.0187)	(0.0187)	(0.0187)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0087	0.0083	0.0084	0.0089	0.0089
	(0.0181)	(0.0181)	(0.0182)	(0.0182)	(0.0181)
Constant	-0.601***	-0.664***	-0.621***	-0.615***	-0.622***
	(0.1940)	(0.1960)	(0.1970)	(0.1950)	(0.1950)
Observation	2,282	2,282	2,282	2,282	2,282
R^2	0.363	0.360	0.357	0.359	0.362

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.2 Export dummy and lagged level of the credit (lag by 2 year)

	(1) Credit by main banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0569	-0.0567	-0.0311	-0.0460	-0.0639
	(0.0390)	(0.0389)	(0.0391)	(0.0392)	(0.0391)
$Credit_{t-2}$	0.0092***	0.0070***	0.022	0.0027	0.0833**
	(0.0031)	(0.0022)	(0.0282)	(0.0024)	(0.0326)
$Ownership_{t-1} * Credit_{t-2}$	0.0273***	0.0190***	0.0315	0.0150**	0.3270***
	(0.0077)	(0.0052)	(0.0677)	(0.0061)	(0.0811)
$\ln(Fixed\ assets_{t-1})$	0.0239	0.0244	0.0299	0.0300	0.0262
	(0.0259)	(0.0259)	(0.0261)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0750***	0.0790***	0.0737***	0.0742***	0.0763***
	(0.0251)	(0.0252)	(0.0253)	(0.0252)	(0.0251)
$\ln(Firm\ age_{t-1})$	0.0234	0.0249	0.0161	0.0159	0.0205
	(0.0254)	(0.0255)	(0.0256)	(0.0254)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0055	0.0041	0.0017	0.0044	0.0074
	(0.0229)	(0.0229)	(0.0230)	(0.0229)	(0.0229)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0037	0.0037	0.0045	0.0048	0.0058
	(0.0216)	(0.0216)	(0.0218)	(0.0217)	(0.0216)
Constant	-0.564***	-0.676***	-0.581***	-0.569***	-0.581***
	(0.2180)	(0.2210)	(0.2230)	(0.2200)	(0.2190)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.383	0.383	0.375	0.378	0.384

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.2 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0709*	-0.0646	-0.0362	-0.0537	-0.0715*
	(0.0395)	(0.0395)	(0.0396)	(0.0397)	(0.0396)
$Credit_{t-2}$	0.0139***	0.00791***	0.0484	0.0053*	0.1070**
	(0.0042)	(0.0027)	(0.0337)	(0.0031)	(0.0433)
$Ownership_{t-1} * Credit_{t-2}$	0.0380***	0.0200***	0.0261	0.0170**	0.4010***
	(0.0170)	(0.0068)	(0.0849)	(0.0083)	(0.1330)
$\ln(Fixed\ assets_{t-1})$	0.0223	0.0254	0.0303	0.0307	0.0269
	(0.0259)	(0.0259)	(0.0260)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0751***	0.0777***	0.0752***	0.0737***	0.0748***
	(0.0251)	(0.0252)	(0.0253)	(0.0252)	(0.0251)
$\ln(Firm\ age_{t-1})$	0.0259	0.0275	0.0177	0.0171	0.0218
	(0.0254)	(0.0256)	(0.0256)	(0.0255)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0040	0.0005	-0.0007	0.0019	0.0047
	(0.0229)	(0.0230)	(0.0231)	(0.0231)	(0.0230)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0051	0.0047	0.0068	0.0052	0.0044
	(0.0217)	(0.0218)	(0.0219)	(0.0218)	(0.0217)
Constant	-0.578***	-0.676***	-0.612***	-0.578***	-0.584***
	(0.2180)	(0.2220)	(0.2240)	(0.2200)	(0.2190)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.384	0.382	0.376	0.378	0.383

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.2 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0744*	-0.0668*	-0.0499	-0.0676*	-0.0771*
	(0.0396)	(0.0396)	(0.0397)	(0.0399)	(0.0398)
$Credit\_main_{t-2}$	0.0084**	0.0067***	0.0134	0.0020	0.0766**
	(0.0033)	(0.0024)	(0.0301)	(0.0024)	(0.0332)
$Ownership_{t-1} * Credit\_main_{t-2}$	0.0218***	0.0153***	-0.0384	0.0119*	0.2900***
	(0.0082)	(0.0058)	(0.0745)	(0.0063)	(0.0845)
$Credit\_other_{t-2}$	0.0041	0.0001	0.0231	0.0046*	0.0294
	(0.0035)	(0.0021)	(0.0279)	(0.0027)	(0.0361)
$Ownership_{t-1} * Credit\_other_{t-2}$	0.0196**	0.0090	0.1840**	0.0155**	0.1480
	(0.0100)	(0.0059)	(0.0794)	(0.0076)	(0.1010)
$\ln(Fixed\ assets_{t-1})$	0.0220	0.0251	0.0293	0.0279	0.0255
	(0.0261)	(0.0260)	(0.0261)	(0.0260)	(0.0260)
$\ln(Employee_{t-1})$	0.0730***	0.0772***	0.0728***	0.0728***	0.0747***
	(0.0252)	(0.0252)	(0.0253)	(0.0252)	(0.0252)
$\ln(Firm\ age_{t-1})$	0.0265	0.02727	0.0217	0.0223	0.0243
	(0.0254)	(0.0255)	(0.0256)	(0.0255)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0047	0.0033	0.0002	0.0026	0.0059
	(0.0229)	(0.0229)	(0.0230)	(0.0229)	(0.0229)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0041	0.0037	0.0045	0.0041	0.0054
	(0.0216)	(0.0217)	(0.0217)	(0.0217)	(0.0216)
Constant	-0.567***	-0.672***	-0.591***	-0.581***	-0.577***
	(0.2180)	(0.2210)	(0.2220)	(0.2200)	(0.2190)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.386	0.384	0.379	0.382	0.385

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.3 Export dummy and lagged level of the credit (lag by 1 & 2 year)

	(1) Credit by main banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0563	-0.0708*	-0.0195	-0.0473	-0.0688*
	(0.0395)	(0.0395)	(0.0394)	(0.0393)	(0.0392)
$Credit_{t-1}$	-0.0061	0.0001	0.1040	0.0029	0.0535
	(0.0153)	(0.0198)	(0.0700)	(0.0044)	(0.0562)
$Credit_{t-2}$	0.0150	0.0066	-0.0553	0.0011	0.0538
	(0.0149)	(0.0193)	(0.0650)	(0.0037)	(0.0486)
$Ownership_{t-1} * Credit_{t-1}$	0.0055	-0.0824**	0.3730**	0.0060	0.1990
	(0.0449)	(0.0413)	(0.1740)	(0.0112)	(0.1330)
$Ownership_{t-1} * Credit_{t-2}$	0.0215	0.0984**	-0.2620	0.0114	0.2030*
	(0.0445)	(0.0402)	(0.1610)	(0.0099)	(0.1220)
$\ln(Fixed\ assets_{t-1})$	0.0240	0.0227	0.0263	0.0310	0.0279
	(0.0260)	(0.0260)	(0.0260)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0743***	0.0805***	0.0750***	0.0742***	0.0754***
	(0.0252)	(0.0252)	(0.0253)	(0.0253)	(0.0251)
$\ln(Firm\ age_{t-1})$	0.0233	0.0241	0.0221	0.0163	0.0219
	(0.0254)	(0.0255)	(0.0256)	(0.0255)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0053	0.0060	0.0042	0.0034	0.0061
	(0.0229)	(0.0229)	(0.0230)	(0.0230)	(0.0229)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0032	0.0056	0.0027	0.0051	0.0051
	(0.0216)	(0.0217)	(0.0217)	(0.0218)	(0.0217)
$Constant$	-0.556**	-0.655***	-0.623***	-0.578***	-0.597***
	(0.2200)	(0.2200)	(0.2300)	(0.2200)	(0.2190)
$Observation$	1,594	1,594	1,594	1,594	1,594
R^2	0.383	0.384	0.379	0.378	0.385

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.3 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0676*	-0.0794**	-0.0212	-0.0557	-0.0750*
	(0.0408)	(0.0402)	(0.0403)	(0.0397)	(0.0397)
$Credit_{t-1}$	-0.0026	0.0039	0.0822	0.0111*	0.160**
	(0.0227)	(0.0285)	(0.1020)	(0.0063)	(0.0799)
$Credit_{t-2}$	0.0164	0.0040	-0.0152	-0.0025	-0.0053
	(0.0227)	(0.0280)	(0.0925)	(0.0054)	(0.0710)
$Ownership_{t-1} * Credit_{t-1}$	-0.0172	-0.102**	0.4590**	-0.0072	0.0692
	(0.0641)	(0.0521)	(0.2310)	(0.0147)	(0.1730)
$Ownership_{t-1} * Credit_{t-2}$	0.0548	0.1190**	-0.3340	0.0229*	0.3660**
	(0.0643)	(0.0511)	(0.2050)	(0.0133)	(0.1630)
$\ln(Fixed\ assets_{t-1})$	0.0223	0.0246	0.0277	0.0309	0.0277
	(0.0259)	(0.0260)	(0.0261)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0751***	0.0794***	0.0763***	0.0765***	0.0762***
	(0.0252)	(0.0252)	(0.0253)	(0.0253)	(0.0252)
$\ln(Firm\ age_{t-1})$	0.0256	0.0270	0.0243	0.0172	0.0225
	(0.0255)	(0.0256)	(0.0257)	(0.0254)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0040	0.0013	0.0014	0.0001	0.0024
	(0.0230)	(0.0230)	(0.0231)	(0.0231)	(0.0230)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0052	0.0067	0.0048	0.0088	0.0065
	(0.0217)	(0.0219)	(0.0219)	(0.0219)	(0.0218)
$Constant$	-0.572***	-0.660***	-0.647***	-0.600***	-0.613***
	(0.2200)	(0.2230)	(0.2240)	(0.2210)	(0.2200)
$Observation$	1,594	1,594	1,594	1,594	1,594
R^2	0.384	0.384	0.378	0.380	0.385

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.3 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0675	-0.0758*	-0.0371	-0.0697*	-0.0815**
	(0.0410)	(0.0403)	(0.0403)	(0.0399)	(0.0399)
$Credit\_main_{t-1}$	-0.0092	0.0006	0.0871	0.0013	0.0354
	(0.0154)	(0.0198)	(0.0709)	(0.0045)	(0.0575)
$Credit\_main_{t-2}$	0.0172	0.0058	-0.0411	0.0007	0.0523
	(0.0151)	(0.0193)	(0.0655)	(0.0037)	(0.0488)
$Ownership_{t-1} * Credit\_main_{t-1}$	-0.0033	-0.1000**	0.3470*	0.0070	0.2440*
	(0.0452)	(0.0459)	(0.1830)	(0.0117)	(0.1430)
$Ownership_{t-1} * Credit\_main_{t-2}$	0.0247	0.1120**	-0.3070*	0.0080	0.1400
	(0.0447)	(0.0447)	(0.1700)	(0.0099)	(0.1260)
$Credit\_other_{t-1}$	-0.0071	0.0237	-0.2420**	0.0117**	0.1490**
	(0.0209)	(0.0280)	(0.1040)	(0.0057)	(0.0710)
$Credit\_other_{t-2}$	0.0114	-0.0233	0.2300**	-0.0042	-0.0865
	(0.0216)	(0.0276)	(0.0968)	(0.0050)	(0.0644)
$Ownership_{t-1} * Credit\_other_{t-1}$	-0.0276	0.0784	-0.0974	-0.0094	-0.1690
	(0.0625)	(0.0751)	(0.2750)	(0.0152)	(0.1860)
$Ownership_{t-1} * Credit\_other_{t-2}$	0.0479	-0.0687	0.2640	0.0227*	0.2740
	(0.0648)	(0.0742)	(0.2560)	(0.0133)	(0.1690)
$\ln(Fixed\ assets_{t-1})$	0.0211	0.0220	0.0282	0.0291	0.0277
	(0.0261)	(0.0261)	(0.0260)	(0.0260)	(0.0260)
$\ln(Employee_{t-1})$	0.0072***	0.0806***	0.0727***	0.0723***	0.0734***
	(0.0253)	(0.0253)	(0.0252)	(0.0253)	(0.0252)
$\ln(Firm\ age_{t-1})$	0.0254	0.0253	0.0255	0.0239	0.0265
	(0.0255)	(0.0256)	(0.0256)	(0.0255)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0045	0.0067	0.0017	0.0010	0.0040
	(0.0229)	(0.0229)	(0.0229)	(0.0229)	(0.0229)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0036	0.0065	0.0005	0.0034	0.0035
	(0.0216)	(0.0217)	(0.0217)	(0.0218)	(0.0216)
$Constant$	-0.546**	-0.643***	-0.638***	-0.609***	-0.613***
	(0.2200)	(0.2200)	(0.2200)	(0.2200)	(0.2190)
$Observation$	1,594	1,594	1,594	1,594	1,594
R^2	0.386	0.386	0.384	0.384	0.388

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.4 Export dummy and lagged level of the credit (average of credit)

	(1) Credits by main bank				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0565	-0.0554	-0.0367	-0.0491	-0.0700*
	(0.0390)	(0.0389)	(0.0391)	(0.0393)	(0.0392)
Average Lagged Credit	0.0093***	0.0069***	0.0392	0.0037	0.1070***
	(0.0032)	(0.0023)	(0.0303)	(0.0028)	(0.0376)
$Ownership_{t-1} * Average\ Lagged\ Credit$	0.0278***	0.0186***	0.0781	0.0177**	0.4010***
	(0.0078)	(0.0053)	(0.0728)	(0.0069)	(0.0915)
$\ln(Fixed\ assets_{t-1})$	0.0240	0.0249	0.0290	0.0313	0.0279
	(0.0260)	(0.0260)	(0.0260)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0753***	0.0789***	0.0747***	0.0737***	0.0754***
	(0.0251)	(0.0252)	(0.0253)	(0.0252)	(0.0251)
$\ln(Firm\ age_{t-1})$	0.0234	0.0242	0.0183	0.0165	0.0219
	(0.0254)	(0.0255)	(0.0256)	(0.0254)	(0.0253)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0056	0.0036	0.0021	0.0033	0.0060
	(0.0229)	(0.0229)	(0.0230)	(0.0229)	(0.0228)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0038	0.0039	0.0048	0.0046	0.0050
	(0.0216)	(0.0217)	(0.0217)	(0.0218)	(0.0216)
Constant	-0.575***	-0.672***	-0.605***	-0.577***	-0.596***
	(0.2190)	(0.2210)	(0.2230)	(0.2200)	(0.2180)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.383	0.382	0.376	0.378	0.385

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.4 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0709*	-0.0632	-0.0408	-0.0561	-0.0768*
	(0.0396)	(0.0395)	(0.0396)	(0.0398)	(0.0398)
Average Lagged Credit	0.0139***	0.0079***	0.0594*	0.0075**	0.1450***
	(0.0042)	(0.0027)	(0.0361)	(0.0036)	(0.0484)
$Ownership_{t-1} * Average\ Lagged\ Credit$	0.0377***	0.0193***	0.0702	0.0169*	0.4420***
	(0.0108)	(0.0069)	(0.0924)	(0.0092)	(0.1250)
$\ln(Fixed\ assets_{t-1})$	0.0225	0.0258	0.0295	0.0321	0.0285
	(0.0259)	(0.0260)	(0.0260)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0753***	0.0777***	0.0755***	0.0742***	0.0745***
	(0.0251)	(0.0252)	(0.0253)	(0.0253)	(0.0251)
$\ln(Firm\ age_{t-1})$	0.0262	0.0268	0.0197	0.0181	0.0235
	(0.0254)	(0.0256)	(0.0257)	(0.0254)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0038	0.00015	-0.0004	-0.0007	0.0017
	(0.0229)	(0.0230)	(0.0231)	(0.02230)	(0.0229)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0051	0.0050	0.0067	0.0067	0.0049
	(0.0217)	(0.0218)	(0.0219)	(0.0219)	(0.0218)
Constant	-0.591***	-0.672***	-0.624***	-0.597***	-0.610***
	(0.2180)	(0.2220)	(0.2240)	(0.2210)	(0.2200)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.384	0.381	0.376	0.379	0.384

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.4 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0737*	-0.0661*	-0.0521	-0.0705*	-0.0827**
	(0.0396)	(0.0396)	(0.0397)	(0.0400)	(0.0399)
Average Lagged Credit_main	0.0083**	0.0067***	0.0341	0.0023	0.0933**
	(0.0034)	(0.0025)	(0.0327)	(0.0029)	(0.0390)
$Ownership_{t-1} * Average\ Lagged\ Credit\_main$	0.0219***	0.0146**	0.0068	0.0137*	0.362***
	(0.0083)	(0.0059)	(0.0801)	(0.0072)	(0.0967)
Average Lagged Credit_other	0.00393	0.0002	0.0104	0.0064**	0.0493
	(0.0035)	(0.0022)	(0.0295)	(0.0030)	(0.0401)
$Ownership_{t-1} * Average\ Lagged\ Credit\_other$	0.0186*	0.0095	0.1770**	0.0153*	0.1280
	(0.0098)	(0.0060)	(0.0835)	(0.0085)	(0.1120)
$\ln(Fixed\ assets_{t-1})$	0.0222	0.0254	0.0292	0.0281	0.0261
	(0.0261)	(0.0260)	(0.0261)	(0.0260)	(0.0259)
$\ln(Employee_{t-1})$	0.0734***	0.0771***	0.0735***	0.0731***	0.0748***
	(0.0252)	(0.0252)	(0.0253)	(0.0252)	(0.0251)
$\ln(Firm\ age_{t-1})$	0.0267	0.0268	0.0223	0.0234	0.0256
	(0.0254)	(0.0255)	(0.0257)	(0.0255)	(0.0254)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0048	0.0029	0.0007	0.0014	0.0048
	(0.0229)	(0.0229)	(0.0230)	(0.0229)	(0.0228)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0042	0.0039	0.0048	0.0042	0.0050
	(0.0216)	(0.0217)	(0.0217)	(0.0217)	(0.0216)
Constant	-0.580***	-0.667***	-0.604***	-0.602***	-0.605***
	(0.2180)	(0.2210)	(0.2230)	(0.2200)	(0.2190)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.385	0.383	0.378	0.382	0.386

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

2.3.2 The Lagged Change of the Credit

Table 2.5 through 2.7 gives us the results for the regression where I use the lagged change of the *Credit* variable ($\triangle Credit$), instead of the level. Now, we can interpret the positive value of $\triangle Credit$ as the positive credit shock to the banks.

As is the cases where I used the lagged level of the *Credit* variable, I add two years lagged *Credit*, and both one year and two years lagged variables in Table 2.6 through 2.7. As we can see, the sign of the coefficients on $\triangle Credit$ and its interaction with $Ownership_{t-1}$ is not consistent. Also, we can find that there is no statistically significant relationship in most cases, while only the coefficient on the number of employee variable is significant.

Table 2.5 Export dummy and lagged change of the credit (lag by 1 year)

	(1) Credits by main bank				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0253	-0.0334	-0.0218	-0.0256	-0.0263
	(0.0387)	(0.0383)	(0.0383)	(0.0384)	(0.0384)
$\triangle Credit_{t-1}$	-0.0165	-0.0129	0.0639	-0.0002	-0.0228
	(0.0150)	(0.0191)	(0.0649)	(0.0036)	(0.0481)
$Ownership_{t-1} * \triangle Credit_{t-1}$	-0.0212	-0.110***	0.2810*	-0.0072	-0.0610
	(0.0446)	(0.0399)	(0.1610)	(0.0097)	(0.1180)
$\ln(Fixed\ assets_{t-1})$	0.0300	0.0265	0.0285	0.0294	0.0294
	(0.0260)	(0.0260)	(0.0260)	(0.0261)	(0.0261)
$\ln(Employee_{t-1})$	0.0710***	0.0742***	0.0719***	0.0731***	0.0727***
	(0.0253)	(0.0252)	(0.0252)	(0.0253)	(0.0253)
$\ln(Firm\ age_{t-1})$	0.0146	0.0166	0.0166	0.0140	0.0146
	(0.0255)	(0.0255)	(0.0255)	(0.0255)	(0.0255)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0019	0.0059	0.0038	0.0032	0.0030
	(0.0229)	(0.0229)	(0.0229)	(0.0230)	(0.0230)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0027	0.0045	0.0016	0.0041	0.0039
	(0.0217)	(0.0216)	(0.0217)	(0.0217)	(0.0217)
Constant	-0.520**	-0.558**	-0.547**	-0.550**	-0.549**
	(0.2210)	(0.2200)	(0.2190)	(0.2200)	(0.2200)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.376	0.379	0.377	0.375	0.375

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.5 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0246	-0.0319	-0.0217	-0.0244	-0.0245
	(0.0386)	(0.0383)	(0.0384)	(0.0384)	(0.0384)
$\triangle Credit_{t-1}$	-0.0111	-0.0116	0.0071	0.0033	0.0378
	(0.0227)	(0.0228)	(0.0924)	(0.0054)	(0.0707)
$Ownership_{t-1} * \triangle Credit_{t-1}$	-0.0360	-0.1260**	0.3310	-0.0185	-0.1930
	(0.0643)	(0.0510)	(0.2050)	(0.0131)	(0.1560)
$\ln(Fixed\ assets_{t-1})$	0.0301	0.0281	0.0297	0.0285	0.0290
	(0.0260)	(0.0260)	(0.0261)	(0.0261)	(0.0261)
$\ln(Employee_{t-1})$	0.0719***	0.0738***	0.0729***	0.0740***	0.0738***
	(0.0253)	(0.0252)	(0.0252)	(0.0253)	(0.0253)
$\ln(Firm\ age_{t-1})$	0.0138	0.0168	0.0166	0.0133	0.0136
	(0.0255)	(0.0256)	(0.0255)	(0.0255)	(0.0255)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0024	0.0042	0.0029	0.0044	0.0038
	(0.0229)	(0.0229)	(0.0229)	(0.0230)	(0.0230)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0034	0.0041	0.0024	0.0045	0.0044
	(0.0217)	(0.0217)	(0.0217)	(0.0217)	(0.0217)
Constant	-0.530**	-0.561**	-0.556**	-0.547**	-0.547**
	(0.2210)	(0.2210)	(0.2200)	(0.2200)	(0.2200)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.375	0.378	0.376	0.376	0.376

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.5 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0248	-0.0305	-0.0266	-0.0261	-0.0257
	(0.0388)	(0.0384)	(0.0384)	(0.0384)	(0.0384)
$\triangle Credit\_main_{t-1}$	-0.0170	-0.0122	0.0458	-0.0001	-0.0242
	(0.0151)	(0.0191)	(0.0652)	(0.0037)	(0.0482)
$Ownership_{t-1} * \triangle Credit\_main_{t-1}$	-0.0203	-0.1260***	0.3240**	-0.00524	-0.0227
	(0.0449)	(0.0442)	(0.1700)	(0.0099)	(0.1240)
$\triangle Credit\_other_{t-1}$	-0.0057	0.0209	-0.2290**	0.0046	0.0892
	(0.0206)	(0.0275)	(0.0959)	(0.0050)	(0.0641)
$Ownership_{t-1} * \triangle Credit\_other_{t-1}$	0.0087	0.0648	-0.3220	-0.0161	-0.1710
	(0.0611)	(0.0736)	(0.2550)	(0.0132)	(0.1660)
$\ln(Fixed\ assets_{t-1})$	0.0302	0.0256	0.0287	0.0307	0.0313
	(0.0261)	(0.0261)	(0.0260)	(0.0261)	(0.0261)
$\ln(Employee_{t-1})$	0.0707***	0.0759***	0.0719***	0.0717***	0.0712***
	(0.0253)	(0.0252)	(0.0252)	(0.0253)	(0.0253)
$\ln(Firm\ age_{t-1})$	0.0146	0.0152	0.0184	0.0146	0.0152
	(0.0255)	(0.0255)	(0.0254)	(0.0255)	(0.0255)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0020	0.0073	0.0021	0.0025	0.0019
	(0.0230)	(0.0230)	(0.0229)	(0.0230)	(0.0230)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0025	0.0051	-0.0001	0.0031	0.0028
	(0.0217)	(0.0217)	(0.0216)	(0.0217)	(0.0217)
Constant	-0.520**	-0.549**	-0.583***	-0.547**	-0.549**
	(0.2210)	(0.2210)	(0.2190)	(0.2200)	(0.2200)
Observation	1,594	1,594	1,594	1,594	1,594
R^2	0.376	0.380	0.381	0.376	0.376

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.6 Export dummy and lagged change of the credit (lag by 2 year)

	(1) Credits by main bank				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0125	-0.0336	-0.0153	-0.0141	-0.0141
	(0.0597)	(0.0604)	(0.0600)	(0.0593)	(0.0593)
$\triangle Credit_{t-2}$	-0.0211	-0.0285	0.0221	0.00231	0.0373
	(0.0298)	(0.0273)	(0.1110)	(0.0055)	(0.0794)
$Ownership_{t-1} * \triangle Credit_{t-2}$	0.0554	-0.0833	0.3790	-0.0154	-0.1160
	(0.0839)	(0.0725)	(0.3090)	(0.0172)	(0.2490)
$\ln(Fixed\ assets_{t-1})$	0.0238	0.0169	0.0219	0.0222	0.0221
	(0.0415)	(0.0416)	(0.0415)	(0.0415)	(0.0415)
$\ln(Employee_{t-1})$	0.0727*	0.0774*	0.0780*	0.0766*	0.0766*
	(0.0402)	(0.0400)	(0.0400)	(0.0400)	(0.0400)
$\ln(Firm\ age_{t-1})$	-0.0296	-0.0225	-0.0303	-0.0317	-0.0305
	(0.0413)	(0.0415)	(0.0413)	(0.0414)	(0.0415)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0098	0.0136	0.0105	0.0108	0.0105
	(0.0364)	(0.0366)	(0.0364)	(0.0363)	(0.0364)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0121	0.0178	0.0160	0.0160	0.0169
	(0.0357)	(0.0353)	(0.0354)	(0.0353)	(0.0353)
Constant	-0.432	-0.422	-0.410	-0.415	-0.417
	(0.3630)	(0.3630)	(0.3620)	(0.3630)	(0.3630)
Observation	756	756	756	756	756
R^2	0.402	0.403	0.403	0.402	0.401

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.6 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0153	-0.0378	-0.0156	-0.0110	-0.0114
	(0.0601)	(0.0606)	(0.0603)	(0.0593)	(0.0594)
$\triangle Credit_{t-2}$	-0.0102	-0.0145	-0.0204	0.0068	0.0973
	(0.0433)	(0.0423)	(0.1550)	(0.0081)	(0.1160)
$Ownership_{t-1} * \triangle Credit_{t-2}$	0.0392	-0.1910*	0.4400	-0.0323	-0.2910
	(0.1180)	(0.1060)	(0.4130)	(0.0244)	(0.3510)
$\ln(Fixed\ assets_{t-1})$	0.0229	0.0163	0.0231	0.0235	0.0229
	(0.0415)	(0.0416)	(0.0416)	(0.0414)	(0.0415)
$\ln(Employee_{t-1})$	0.0748*	0.0793**	0.0786**	0.0755*	0.0765*
	(0.0402)	(0.0399)	(0.0400)	(0.0399)	(0.0399)
$\ln(Firm\ age_{t-1})$	-0.0300	-0.0229	-0.0292	-0.0350	-0.0330
	(0.0414)	(0.0417)	(0.0414)	(0.0414)	(0.0415)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0109	0.0171	0.00852	0.0116	0.0108
	(0.0364)	(0.0365)	(0.0365)	(0.0363)	(0.0363)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0144	0.0192	0.0178	0.0172	0.0190
	(0.0359)	(0.0353)	(0.0355)	(0.0353)	(0.0354)
Constant	-0.420	-0.405	-0.420	-0.433	-0.435
	(0.3630)	(0.3630)	(0.3630)	(0.3620)	(0.3630)
Observation	756	756	756	756	756
R^2	0.401	0.404	0.402	0.403	0.402

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.6 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0228	-0.0430	-0.0265	-0.0113	-0.0105
	(0.0600)	(0.0611)	(0.0603)	(0.0594)	(0.0596)
$\triangle Credit\_main_{t-2}$	-0.0175	-0.0290	0.0077	0.0023	0.0343
	(0.0301)	(0.0273)	(0.1120)	(0.0055)	(0.0797)
$Ownership_{t-1} * \triangle Credit\_main_{t-2}$	0.0667	-0.0647	0.4060	-0.0181	-0.1310
	(0.0842)	(0.0730)	(0.3120)	(0.0175)	(0.2500)
$\triangle Credit\_other_{t-2}$	0.0371	0.0550	-0.0142	0.0004	-0.0148
	(0.0449)	(0.0453)	(0.1430)	(0.0076)	(0.1070)
$Ownership_{t-1} * \triangle Credit\_other_{t-2}$	0.1530	-0.2400*	-0.7720*	-0.0237	-0.2280
	(0.1360)	(0.1320)	(0.4370)	(0.0235)	(0.3230)
$\ln(Fixed\ assets_{t-1})$	0.0231	0.0259	0.0239	0.0214	0.0215
	(0.0416)	(0.0420)	(0.0415)	(0.0415)	(0.0416)
$\ln(Employee_{t-1})$	0.0719*	0.0683*	0.0751*	0.0755*	0.0760*
	(0.0403)	(0.0402)	(0.0400)	(0.0400)	(0.0400)
$\ln(Firm\ age_{t-1})$	-0.0266	-0.0227	-0.0264	-0.0334	-0.0316
	(0.0414)	(0.0416)	(0.0414)	(0.0415)	(0.0416)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0112	0.0104	0.0102	0.0120	0.0115
	(0.0364)	(0.0366)	(0.0363)	(0.0364)	(0.0364)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0104	0.0150	0.0131	0.0154	0.0162
	(0.0360)	(0.0353)	(0.0355)	(0.0355)	(0.0355)
$Constant$	-0.473	-0.370	-0.430	-0.426	-0.422
	(0.3640)	(0.3640)	(0.3640)	(0.3630)	(0.3640)
$Observation$	756	756	756	756	756
R^2	0.404	0.407	0.406	0.403	0.402

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.7 Export dummy and lagged change of the credit (lag by 1 & 2 year)

	(1) Credits by main bank				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0438	0.0603	-0.0375	-0.0485	-0.0666
	(0.0631)	(0.0795)	(0.0692)	(0.0669)	(0.0702)
$\triangle Credit_{t-1}$	0.0079	-0.0037	0.1160	-0.0093	-0.1390
	(0.0226)	(0.0367)	(0.1070)	(0.0074)	(0.0908)
$\triangle Credit_{t-2}$	-0.0245	-0.0291	0.0147	-0.0013	-0.0343
	(0.0299)	(0.0276)	(0.1110)	(0.0061)	(0.0917)
$Ownership_{t-1} * \triangle Credit_{t-1}$	-0.1080	-0.1830*	0.2180	-0.0171	-0.2920
	(0.0693)	(0.1020)	(0.3210)	(0.0197)	(0.2420)
$Ownership_{t-1} * \triangle Credit_{t-2}$	0.0721	-0.0631	0.3420	-0.0243	-0.3090
	(0.0850)	(0.0734)	(0.3120)	(0.0193)	(0.2900)
$\ln(Fixed\ assets_{t-1})$	0.0238	0.0133	0.0186	0.0195	0.0163
	(0.0415)	(0.0416)	(0.0416)	(0.0415)	(0.0416)
$\ln(Employee_{t-1})$	0.0739*	0.0824**	0.0765*	0.0759*	0.0764*
	(0.0402)	(0.0401)	(0.0400)	(0.0400)	(0.0401)
$\ln(Firm\ age_{t-1})$	-0.0297	-0.0277	-0.0258	-0.0295	-0.0267
	(0.0413)	(0.0418)	(0.0416)	(0.0416)	(0.0416)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0123	0.0156	0.0136	0.0136	0.0152
	(0.0364)	(0.0366)	(0.0364)	(0.0365)	(0.0366)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0140	0.0205	0.0116	0.0220	0.0224
	(0.0357)	(0.0354)	(0.0355)	(0.0355)	(0.0354)
$Constant$	-0.391	-0.469	-0.422	-0.404	-0.399
	(0.3680)	(0.3640)	(0.3630)	(0.3630)	(0.3640)
$Observation$	756	756	756	756	756
R^2	0.404	0.407	0.405	0.404	0.405

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.7 (cont'd)

	(2) Weighted average of credit				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0448	-0.0957	-0.0562	-0.0785	-0.1180
	(0.0640)	(0.0886)	(0.0748)	(0.0719)	(0.0777)
$\triangle Credit_{t-1}$	0.0167	0.0289	0.0584	-0.0078	-0.0951
	(0.0357)	(0.0535)	(0.1580)	(0.0108)	(0.1360)
$\triangle Credit_{t-2}$	-0.0164	-0.0190	-0.0168	0.0039	0.0479
	(0.0435)	(0.0423)	(0.1550)	(0.0091)	(0.1360)
$Ownership_{t-1} * \triangle Credit_{t-1}$	-0.1520	-0.2950**	0.4300	-0.0427	-0.7340**
	(0.1070)	(0.1430)	(0.4620)	(0.0285)	(0.3610)
$Ownership_{t-1} * \triangle Credit_{t-2}$	0.0575	-0.1780*	0.3820	-0.0521*	-0.7380*
	(0.1190)	(0.1070)	(0.4170)	(0.0278)	(0.4150)
$\ln(Fixed\ assets_{t-1})$	0.0216	0.0143	0.0219	0.0198	0.0162
	(0.0416)	(0.0416)	(0.0417)	(0.0415)	(0.0415)
$\ln(Employee_{t-1})$	0.0755*	0.0878**	0.0780*	0.0761*	0.0793**
	(0.0403)	(0.0400)	(0.0400)	(0.0399)	(0.0400)
$\ln(Firm\ age_{t-1})$	-0.0354	-0.0271	-0.0229	-0.0342	-0.0316
	(0.0415)	(0.0418)	(0.0418)	(0.0416)	(0.0417)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0154	0.0143	0.0105	0.0161	0.0179
	(0.0366)	(0.0366)	(0.0366)	(0.0365)	(0.0365)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0167	0.0262	0.0141	0.0213	0.0237
	(0.0360)	(0.0355)	(0.0357)	(0.0355)	(0.0354)
$Constant$	-0.382	-0.432	-0.428	-0.392	-0.358
	(0.3690)	(0.3640)	(0.3640)	(0.3660)	(0.3670)
$Observation$	756	756	756	756	756
R^2	0.403	0.409	0.403	0.406	0.407

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parentheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

Table 2.7 (cont'd)

	(3) Separate credits by main bank from other banks				
	Bank Capital/ Assets	Tier 1 Capital	Non-Performing Loans	ROE	ROA
$Ownership_{t-1}$	-0.0485	0.0272	-0.0546	-0.0981	-0.129
	(0.0638)	(0.0891)	(0.0843)	(0.0762)	(0.0829)
$\triangle Credit\_main_{t-1}$	0.0039	0.0163	0.0946	-0.0072	-0.1090
	(0.0229)	(0.0372)	(0.1110)	(0.0075)	(0.0923)
$\triangle Credit\_main_{t-2}$	-0.0202	-0.0248	-0.0366	0.0009	0.0076
	(0.0302)	(0.0280)	(0.1130)	(0.0063)	(0.0950)
$Ownership_{t-1} * \triangle Credit\_main_{t-1}$	-0.1110	-0.1960*	0.1290	-0.0190	-0.3330
	(0.0699)	(0.1020)	(0.3290)	(0.0199)	(0.2440)
$Ownership_{t-1} * \triangle Credit\_main_{t-2}$	0.0817	-0.0318	0.4050	-0.0323	-0.4290
	(0.0853)	(0.0754)	(0.3170)	(0.0198)	(0.2960)
$\triangle Credit\_other_{t-1}$	-0.0154	0.0772	-0.3920**	0.0098	0.1950
	(0.0284)	(0.0489)	(0.1990)	(0.0102)	(0.1310)
$\triangle Credit\_other_{t-2}$	0.0390	0.0674	-0.0657	0.0055	0.1110
	(0.0450)	(0.0462)	(0.1520)	(0.0088)	(0.1310)
$Ownership_{t-1} * \triangle Credit\_other_{t-1}$	-0.0558	0.1160	0.2330	-0.0463	-0.6340
	(0.0856)	(0.1520)	(0.6220)	(0.0306)	(0.3950)
$Ownership_{t-1} * \triangle Credit\_other_{t-2}$	0.1490	-0.2600*	-0.6780	-0.0473*	-0.6680
	(0.1370)	(0.1350)	(0.4660)	(0.0284)	(0.4190)
$\ln(Fixed\ assets_{t-1})$	0.0236	0.0229	0.0253	0.0226	0.0206
	(0.0416)	(0.0420)	(0.0416)	(0.0417)	(0.0417)
$\ln(Employee_{t-1})$	0.0706*	0.0760*	0.0705*	0.0713*	0.0724*
	(0.0404)	(0.0402)	(0.0400)	(0.0401)	(0.0401)
$\ln(Firm\ age_{t-1})$	-0.0323	-0.0330	-0.0260	-0.0267	-0.0250
	(0.0418)	(0.0419)	(0.0417)	(0.0419)	(0.0419)
$\ln(Capital - Labor\ ratio_{t-1})$	0.0143	0.0136	0.0117	0.0124	0.0138
	(0.0364)	(0.0365)	(0.0363)	(0.0366)	(0.0366)
$\ln(Value\ added\ per\ worker_{t-1})$	0.0115	0.0218	0.0035	0.0200	0.0233
	(0.0361)	(0.0355)	(0.0357)	(0.0357)	(0.0356)
Constant	-0.400	-0.399	-0.377	-0.308	-0.263
	(0.3690)	(0.3650)	(0.3650)	(0.3690)	(0.3710)
Observation	756	756	756	756	756
R^2	0.408	0.416	0.412	0.408	0.410

Note: Coefficients on the industry and year dummies are not reported.
Standard errors are in parenttheses.
***, **, * indicate statistically significant at the 1%, 5%, and 10% significance level respectively.

2.4 Summary and Conclusion

There have been many articles that examine the effect of bank's financial health on the firm's real activities. The main contribution of this paper is that I test whether the corporate governance as measured by ownership concentration following Joh (2003), computed as the sum of the shareholdings by family members, makes the firm's export resilient when the negative shock occurs to the banks. Also, with the help of hand-collected matched bank-firm loans data, I could identify the main for each firm and compute the share of loans from multiple creditor banks.

Main finding is that the more concentrated ownership structure for the firm in terms of family members shareholdings helps the firm's export activity more resilient when financial health of banks from which the firm borrows get worse. It is not only financial health of its main bank, but also that of all other creditor banks that affects the firm's export activity. Also, when separating the *Credit* by main bank and other banks at the same time, the main bank plays more significant role than other creditor banks.

This paper have a number of implications for the future research. First, the matched bank-firm loans data for another years could make the test more robust. Given this matched data for two years only, I assumed that the share of loans from the banks for each firm is consistent even before those two years. So, if we collect the matched data for longer period and more firms could fill this gap. Second, we can add the chaebol dummy variable to see if the chaebol-affiliated firm can makes any significant difference in the extensive margin effect.

REFERENCES

REFERENCES

Amiti, M. and D. E. Weinstein: 2011, 'Exports and Financial Shocks'. *Quarterly Journal of Economics* **126**(4), 1841–1877.

Bae, K.-H., J.-K. Kang, and C.-W. Lim: 2002, 'The value of durable bank relationships: evidence from Korean banking shocks'. *Journal of financial economics* **64**(2), 181–214.

Bernard, A. B. and J. B. Jensen: 2004, 'Why some firms export'. *Review of Economics and Statistics* **86**(2), 561–569.

Joh, S. W.: 2003, 'Corporate governance and firm profitability: evidence from Korea before the economic crisis'. *Journal of financial Economics* **68**(2), 287–322.

CHAPTER 3
The Survey of Effects of Financial Shocks and Corporate Governance on the Firms

3.1 Introduction

Since the global financial crisis, researchers and policy makers are paying more attention to the impact of the financial shocks on the overall real economy. Specifically, there are growing number of literatures that study the importance of financial institutions - the bank in particular - as a credit supplier to the firms, in the sense that the shocks to the bank health or the credit shock to banks may affect the firm in many aspects. Also, the corporate ownership structure is known to have a significant impact on the firm's decision on financing as well as firm performance.

In this chapter, I explain and explore the previous literatures that investigate the effects of financial shocks and corporate govenance on the side of firms.

3.2 Empirical Works

3.2.1 Financial Shocks

The financial shocks have an significant impact on firm's diverse real activities. For example, studies show that domestic financial shocks negatively affect corporate investments (Duchin et al. (2010)), (Amiti and Weinstein (2013))), tech spending, employment, and capital spending (Campello et al. (2010)) as well as export (Amiti and Weinstein (2011)). Also, based on Peek and Rosengren (2000), Cetorelli and Goldberg (2011), Cull and Peria

(2013) found the evidence that the financial shocks are transmitted by global banks even across the country through banking sector.

Especially, the rapid decline in international trade during the 2007-2009 global financial crisis triggered renewed interest in these questions again, with recent studies affirming that credit tightening was an important channel through which the crisis distressed world trade. The financial crisis in 2008 has led researchers to ask whether credit constraints faced by exporters played a significant role in the global trade slowdown. There is a wide range of answers.

Amiti and Weinstein (2011), which matches Japanese exporters to the banks which provide them with trade credit and finds a strong link between the financial health of these banks and firm export growth. There is also growing micro-level evidence that credit market imperfections severely restrict firms' export capacity. Muûls et al. (2008) shows that liquidity-constrained firms in Belgium are less likely to become exporters by using an indicator of firms' credit worthiness. Similar results are reported by Berman and Héricourt (2010), who proxy firms' liquidity needs with balance-sheet variables for 5,000 firms in 9 developing economies.

A challenge for these studies has been establishing a causal effect of credit conditions on firms' export performance since the measures of financial constraints they use are endogenous to firms' international trade decisions. More recently, Amiti and Weinstein (2011) have explored exogenous shocks to firms' availability of external finance, and shown that Japanese banks transmitted financial shocks to exporters through the channel of trade finance during the systemic crises that plagued Japan in the 1990s. Similarly, Bricongne et al. (2010) have found that the exports of French firms in more external-finance dependent sectors were more adversely hit during the recent global crisis.

Minetti and Zhu (2011) use survey data on firms' credit rationing in Italy to estimate the impact of credit rationing on firm's export. They find that that the probability of exporting is lower for rationed firms and that credit rationing reduces foreign sales.

Paravisini et al. (2015) find that the reversal of capital flows during the global financial crisis negatively affected the export capacity of Peruvian exporters. Chor and Manova (2012) find that financially vulnerable sectors in source countries did indeed experience a sharper drop in monthly exports to the United States. Behrens et al. (2013) argue that for Belgium, to the extent that financial variables affected exports, they also affected domestic sales to the same extent.

In contrast, there is a literature that finds no evidence that trade credit played a role in restricting imports or exports for the United States (Levchenko et al. (2010))

Understanding the role of financial frictions for firms' export participation has important policy implications, particularly for underdeveloped countries that have high resilience on extensive cross-border trade for economic growth.

3.2.2 Corporate Governance

Ownership structure is an important factor in determining firm value (Demsetz and Lehn (1985)). Jensen and Meckling (1976) concentrated ownership by owner-managers minimizes the agency problem that arises from the separation of ownership and control.

The family ownership can lead to better monitoring of managerial discretion and reduce principal-agent costs associated with diffused share ownership structures. According to this argument, the firm where the family members hold more shares may provide a competitive advantage and improve short- and long-term performance (Anderson and Reeb (2003)). There are a number of empirical studies: Chang (2003) finds that controlling family ownership is associated with better performance in South Korea. Joh (2003) examines the relationship between ownership structures and the firm's accounting performance using over 5,800 sample firms in Korea. She finds that before the currency crisis in 1997, Korean firms whose controlling family shareholders had more ownership outperformed those where the family members ownership is less concentrated. Mitton (2002) also shows that higher block ownership by the largest shareholder is associated

with higher crisis-period stock returns.

The corporate ownership structure also have an impact on the firm's financing decision. Lin et al. (2011) find that the cost of debt financing is significantly higher for companies with a wider divergence between the largest ultimate owner's control rights and cash-flow rights. Lin et al. (2012) show that the divergence between the control rights and cash-flow rights of a borrowing firm's largest ultimate owner has a significant impact on the concentration and composition of the firm's loan syndicate. They also investigate the relation between a borrowing firm's ownership structure and its choice of debt source and find that the divergence between the control rights and cash-flow rights of a borrowing firm's largest ultimate owner has a significant negative impact on the firm's reliance on bank debt financing (Lin et al. (2013)). Minetti and Yun (2015) suggests that ownership concentration negatively affects the percentage share of the loan held by the lead arranger as a measure of the syndicated loan concentration., and these effects weaken after the chaebol reform of the late nineties in Korea. Also, Minetti et al. (2015)Minetti et al. (2015) study the effects of family ownership on export using data on Italian firms and shows that family ownership increases the probability that firms export.

REFERENCES

REFERENCES

Amiti, M. and D. E. Weinstein: 2011, 'Exports and Financial Shocks'. *Quarterly Journal of Economics* **126**(4), 1841–1877.

Amiti, M. and D. E. Weinstein: 2013, 'How much do bank shocks affect investment? Evidence from matched bank-firm loan data'. Technical report, National Bureau of Economic Research.

Anderson, R. C. and D. M. Reeb: 2003, 'Founding-family ownership and firm performance: evidence from the S&P 500'. *The journal of finance* **58**(3), 1301–1328.

Behrens, K., G. Corcos, and G. Mion: 2013, 'Trade crisis? What trade crisis?'. *Review of economics and statistics* **95**(2), 702–709.

Berman, N. and J. Héricourt: 2010, 'Financial factors and the margins of trade: Evidence from cross-country firm-level data'. *Journal of Development Economics* **93**(2), 206–217.

Bricongne, J. C., L. Fontagné, G. Gaulier, D. Taglioni, and V. Vicard: 2010, 'Exports and sectoral financial dependence: evidence on French firms during the great global crisis'.

Campello, M., J. R. Graham, and C. R. Harvey: 2010, 'The real effects of financial constraints: Evidence from a financial crisis'. *Journal of Financial Economics* **97**(3), 470–487.

Cetorelli, N. and L. S. Goldberg: 2011, 'Global banks and international shock transmission: Evidence from the crisis'. *IMF Economic Review* **59**(1), 41–76.

Chang, S. J.: 2003, 'Ownership structure, expropriation, and performance of group-affiliated companies in Korea'. *Academy of Management Journal* **46**(2), 238–253.

Chor, D. and K. Manova: 2012, 'Off the cliff and back? Credit conditions and international trade during the global financial crisis'. *Journal of international economics* **87**(1), 117–133.

Cull, R. and M. S. M. Peria: 2013, 'Bank ownership and lending patterns during the 2008–2009 financial crisis: evidence from Latin America and Eastern Europe'. *Journal of Banking & Finance* **37**(12), 4861–4878.

Demsetz, H. and K. Lehn: 1985, 'The structure of corporate ownership: Causes and consequences'. *Journal of political economy* **93**(6), 1155–1177.

Duchin, R., O. Ozbas, and B. A. Sensoy: 2010, 'Costly external finance, corporate investment, and the subprime mortgage credit crisis'. *Journal of Financial Economics* **97**(3), 418–435.

Jensen, M. C. and W. H. Meckling: 1976, 'Theory of the firm: Managerial behavior, agency costs and ownership structure'. *Journal of financial economics* **3**(4), 305–360.

Joh, S. W.: 2003, 'Corporate governance and firm profitability: evidence from Korea before the economic crisis'. *Journal of financial Economics* **68**(2), 287–322.

Levchenko, A. A., L. T. Lewis, and L. L. Tesar: 2010, 'The collapse of international trade during the 2008–09 crisis: in search of the smoking gun'. *IMF Economic review* **58**(2), 214–253.

Lin, C., Y. Ma, P. Malatesta, and Y. Xuan: 2011, 'Ownership structure and the cost of corporate borrowing'. *Journal of Financial Economics* **100**(1), 1–23.

Lin, C., Y. Ma, P. Malatesta, and Y. Xuan: 2012, 'Corporate ownership structure and bank loan syndicate structure'. *Journal of Financial Economics* **104**(1), 1–22.

Lin, C., Y. Ma, P. Malatesta, and Y. Xuan: 2013, 'Corporate ownership structure and the choice between bank debt and public debt'. *Journal of Financial Economics* **109**(2), 517–534.

Minetti, R., P. Murro, and S. C. Zhu: 2015, 'Family Firms, Corporate Governance and Export'. *Economica* **82**(s1), 1177–1216.

Minetti, R. and S.-G. Yun: 2015, 'Institutions, Bailout Policies, and Bank Loan Contracting: Evidence from Korean Chaebols'. *Review of Finance* **19**(6), 2223–2275.

Minetti, R. and S. C. Zhu: 2011, 'Credit constraints and firm export: Microeconomic evidence from Italy'. *Journal of International Economics* **83**(2), 109–125.

Mitton, T.: 2002, 'A cross-firm analysis of the impact of corporate governance on the East Asian financial crisis'. *Journal of financial economics* **64**(2), 215–241.

Muûls, M. et al.: 2008, 'Exporters and credit constraints: A firm-level approach'. Technical report, National Bank of Belgium Brussels.

Paravisini, D., V. Rappoport, P. Schnabl, and D. Wolfenzon: 2015, 'Dissecting the effect of credit supply on trade: Evidence from matched credit-export data'. *The Review of Economic Studies* **82**(1), 333–359.

Peek, J. and E. S. Rosengren: 2000, 'Collateral damage: Effects of the Japanese bank crisis on real activity in the United States'. *American Economic Review* pp. 30–45.