Credit Reallocation, Deleveraging, and Financial Crises

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Keywords: Credit Reallocation, Credit Growth, Financial Crises.

JEL Codes: E44

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Abstract

This paper studies how the process of reallocation of credit across firms behaves before and after financial crises. Applying the methodology proposed by Davis and Haltiwanger (1992) for measuring job reallocation, we track the dynamics of credit reallocation across Korean firms for over three decades (1980−2012). The credit boom preceding the 1997 crisis featured a slowdown of credit reallocation. After the crisis and the associated reforms, the creditless recovery (deleveraging) masked a dramatic intensification and increased procyclicality of credit reallocation. The findings suggest that the crisis and the associated reforms have triggered an efficiency-enhancing increase in the fluidity of the credit market.

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1 Introduction

The Great Recession has reignited the debate over the dynamics of the credit market before and after financial crises. Several scholars put emphasis on the credit booms that often precede the crises and the sluggish credit growth (deleveraging) that follows them (Gourinchas and Obstfeld, 2012; Reinhart and Rogoff, 2009; Dell'Ariccia, Igan, Laeven and Tong, 2012; IMF, 2004). A popular argument is that periods of

credit bonanza can fuel excessive investment, culminating in financial crashes. In turn, financial crashes can trigger a drastic change in the lending policies of investors and financial institutions, resulting into slow credit growth during the recoveries (Mendoza and Terrones, 2012; The Economist, 2012). The policies enacted in response to financial crashes to prevent new credit booms and busts can exacerbate the "creditless" nature of the recoveries. Economists debate whether such deleveraging processes help or hinder the recoveries.

In contrast with the extensive knowledge on the behavior of aggregate credit growth, we know very little about the dynamic process of reallocation of credit across firms before and after financial crises. Yet, by now there is established evidence that, due to pronounced firm heterogeneity and imperfect substitutability between internal and external finance, the allocation of liquidity among firms plays a key role in affecting aggregate economic activity. Numerous studies find that the macroeconomic impact of financial shocks, including structural financial reforms, occurs through the allocation of liquidity across firms as much as through the total volume of liquidity available to the business sector (Caballero and Hammour, 2005; Eisfeldt and Rampini, 2006; Caballero, Hoshi and Kashyap, 2008; Beck, Levine and Loayza, 2000; Galindo, Schiantarelli and Weiss, 2007).

These observations elicit fundamental questions: do the credit booms that precede financial crises feature an intense reallocation of credit or a mere rollover of credit to firms already served by the credit market? Do financial crises and the subsequent reforms enhance the fluidity with which the credit market is able to reallocate funds across businesses? Or does the deleveraging process that often follows the crises stifle the allocative function of the credit market? Answering these questions can yield new insights into the interaction between the credit market and the aggregate economy in the build-up and aftermath of financial crises, helping discipline macroeconomic models with credit market imperfections and heterogeneous firms. It can also help shape the response to credit booms and busts. For example,

during a creditless recovery, both a policy that promotes the creation of new lines of credit and a policy that prevents the termination of existing credit relationships will boost credit growth. However, these two types of intervention will exert opposite effects on credit reallocation: promoting credit creation will foster credit reallocation, while hindering credit destruction will depress it.

This paper takes a step towards addressing these issues. We study the dynamic process of reallocation of credit across South Korean non-financial businesses over more than three decades (1980−2012) and investigate whether the credit reallocation process changed after the 1997 Korean financial crisis and the subsequent reforms. Throughout the analysis, we contrast the behavior of inter-firm credit reallocation with that of aggregate credit growth. The Korean economy and our unique firm-level database constitute an ideal testing ground for our purposes. Credit is a key source of external finance for Korean firms (accounting for 82% of their external funding in 2000).[1] Our data set comprises unusually rich microeconomic data on more than 30,000 non-financial firms, representing about 50% of employment of Korea in 2000, for example.[2] Moreover, the data set covers a long time period (more than 30 years) and features the occurrence of a major financial crisis around the sample midpoint (end of 1997). This allows to separate cyclical changes in the credit reallocation process, as induced by the crisis, from structural long-lasting changes. Lastly, the data set enables us to separately track the reallocation of loans and that of bonds. This is important, as the financial reforms implemented in response to the crisis especially targeted banks and other loan-granting institutions.

In South Korea, credit growth was rapid throughout the 1990s and further accelerated during the credit boom that took place from 1993 till the onset of the crisis in 1997. Prior to the crisis, the allocation of credit was influenced by government policies. Many firms, especially those affiliated to business conglomerates (*chaebols*),

[1] Source: Flow of Funds, Bank of Korea.

[2] The data source is KISLINE, the business information source provided by the leading Korean credit rating agency, Korea Investors Service (KIS), which is affiliated with Moody's.

were guaranteed the renewal of loans without close scrutiny by financial institutions (Jwa, 2002). The 1997 crisis caused a credit crunch and a sharp decline in GDP (by 5.7% in 1998). In response to the crisis, the government enacted structural reforms of the corporate and financial sectors that affected both the demand side and the supply side of the credit market. These reforms aimed at reducing firms' leverage and inducing lenders to adopt less inertial and more selective policies in allocating credit. The economy started to recover from the crisis in the second half of 1998 and GDP growth rebounded to 10.7% in 1999 and 8.8% in 2000. In the years following the crisis, credit to the business sector grew at a pace significantly lower than in the pre-crisis period, triggering a deleveraging of the business sector.

To measure the continuous dynamic process of credit reallocation across firms, we employ the methodology proposed by Davis and Haltiwanger (1992) for the measurement of job reallocation and used by Herrera, Kolar and Minetti (2011) for the measurement of credit reallocation across U.S. firms. Average real credit growth exceeded 9.5% per year in the pre-crisis (1981−1996) period, and peaked at almost 10.5% during the 1993−1996 credit boom. After the crisis, during the deleveraging period (1999 through 2004) credit shrank at an average annual rate of 2.7%, and overall, between 1999 and 2012, expanded at an annual rate of only 3%. This drop in credit growth could be attained through a reduction in the rate of credit creation and a relatively stable credit destruction, thus implying less intense reallocation of credit across firms. Alternatively, it could be attained through a relatively stable credit creation and an increase in credit destruction, thus implying more intense reallocation of credit. We find that Korea followed the latter path. On average, the annual rate of inter-firm gross credit reallocation (the sum of credit creation and credit destruction) was about 21.4% between 1981 and 2012. The intensity of gross credit reallocation rose significantly after the crisis, from an average of 17.9% in 1981−1996 to an average of 24.7% in 1999−2012. If we net out from gross credit reallocation the amount of reallocation strictly needed to accommodate aggregate

credit growth, we obtain that, after being depressed at an average of 7.0% during the 1993−1996 credit boom, the annual rate of excess credit reallocation jumped to an average of 19.0% in 1999−2012.

The reader can wonder whether the dramatic increase in credit reallocation after the crisis can be explained by the "flights to quality" (e.g., the flights of credit from small to large firms) that often characterize crises (Bernanke, Gertler and Gilchrist, 1999, 1996). This is not the case. Consistent with the flight to quality argument, we indeed uncover evidence that the reshuffling of credit across groups of firms different in size, industry, and location intensified during the crisis. However, after the crisis, the reallocation of credit within roughly homogenous groups of firms grew in importance relative to the reshuffling of credit across such groups.

Overall, this first set of findings support the view that the corporate and financial reforms enacted in response to the crisis mitigated the frictions hindering the continuous process of reallocation of credit across businesses. In particular, the reforms might have altered the lending policies of financial institutions, prompting them to expand credit less aggressively than before the crisis but to reallocate credit across firms more flexibly, rather than inertially renewing loans to the same borrowers over time (Lim, 2010). In support of this argument, when we break down credit into loans and bonds, we find that the increase in reallocation was significantly more pronounced for loans than for bonds. This hints at a change in the dynamism with which after the crisis financial institutions, such as banks, reallocated loans.

We then turn to explore whether, besides its intensity, the dynamic behavior of credit reallocation also changed after the crisis. The volatility of credit reallocation increased. Moreover, in line with what found for the intensity of reallocation, the contribution to the volatility of credit reallocation of the idiosyncratic (firm-level) credit changes grew relative to the contribution of sectoral and aggregate shocks. Yet, the most interesting finding probably pertains to the cyclical behavior. The intensity of gross credit reallocation was mildly procyclical in the 1981−2012 period.

When we split gross credit reallocation into its components, we find that prior to the crisis this procyclical behavior was especially driven by credit growth. By contrast, after the crisis credit growth became almost acyclical while excess credit reallocation exhibited a procyclical pattern.

In the last part of the paper, we gather evidence on whether the higher dynamism of the credit market in reallocating liquidity was associated with an improvement in the efficiency of the reallocation process. To this end, we construct an index of credit reallocation efficiency employing firms' sales-to-capital ratios and profits-to-capital ratios as proxies for firm productivity and efficiency. We uncover evidence that before the crisis the efficiency of the credit reallocation process often worsened from one year to the next; after the crisis, the intensification of credit reallocation was associated with enhanced efficiency in the reallocation process.

The remainder of the paper unfolds as follows. Section 2 relates the analysis to prior literature. Section 3 describes the reforms of the corporate and financial sectors that we expect to have affected the process of credit reallocation. Section 4 details the data and the empirical methodology. Section 5 investigates the intensity of credit reallocation before and after the financial crisis, exploring also the contribution of flight to quality episodes. Section 6 focuses on the time series properties of credit reallocation. Section 7 examines the efficiency of the credit reallocation process. Section 8 concludes. Additional results are relegated to the online Supplement.

2 Prior Literature

This paper relates to two strands of empirical literature. The first strand investigates the interaction between the credit market and the business cycle. Claessens, Kose and Terrones (2012) examine the interplay between business cycles and financial cycles using aggregate data for advanced and emerging countries. Mendoza and Terrones (2012) study the anatomy of credit booms and busts in a large set of emerging countries. By means of historical narrative and econometric techniques, Bordo

and Haubrich (2010) analyze the cyclical comovement of credit, output and money in the Unites States over more than a century. In this strand of literature, a number of studies focus on the flight to quality episodes during recessions (Bernanke, Gertler and Gilchrist, 1996). Kashyap, Stein and Wilcox (1993) document an increase in commercial paper relative to bank loans during downturns. Lang and Nakamura (1995) and Oliner and Rudebush (1995) provide evidence of a reshuffling of bank credit from small to large firms after monetary contractions. Only recently few studies have started to analyze the continuous dynamic process of reallocation of funds that occurs in the credit market. Dell'Ariccia and Garibaldi (2005) study the process of reallocation of loans across U.S. banks. Herrera et al. (2011) document stylized facts of the process of reallocation of credit across U.S. firms using Compustat data. Neither paper studies the role of financial crises in credit reallocation and how credit reallocation relates to credit booms and to deleveraging processes.

The second related strand of literature investigates the allocative function of financial markets and how this function is affected by business cycles and structural reforms. Eisfeldt and Rampini (2006) and Chen and Song (2013) examine how contractual and financial frictions can influence the allocation of physical capital across businesses. Galindo, Schiantarelli and Weiss (2007) study the impact of structural financial shocks, such as financial liberalizations, on the inter-firm allocation of physical investment. Gilchrist, Sim and Zakrajsek (2013) relate the distribution of borrowing costs to the distribution of total factor productivity across firms. Our analysis can help these studies understand what changes in the continuous dynamic process of reallocation of liquidity in the financial sector can generate the observed ex-post outcomes in terms of cross-firm distribution of physical capital and TFP. In this strand of literature, some microeconometric studies examine how financial institutions allocate loans after crises and the associated reforms. Borensztein and Lee (2002, 2005) find that in Korea credit was not directed to profitable sectors in the 1970−1996 period, whereas profitability was important for maintaining access

to credit during the 1997 financial crisis. Using Indonesian data, Blalock, Gertler and Levine (2008) show that foreign-owned firms − reputed to be less vulnerable to credit constraints − performed better than domestically owned firms during the East Asian crisis. Unlike these studies, in this paper we take a macroeconomic perspective: we construct an aggregate indicator of the continuous dynamic process of credit reallocation that, together with measures of aggregate credit growth or credit over GDP, can be used by macroeconomists for summarizing and tracking the dynamics of the credit market. Employing this indicator, we study the fluidity with which the credit market performs its allocative function before and after financial crises and the implications this has for allocative efficiency.

3 Crisis, reforms, and the credit market

The South Korean economy experienced sustained average output growth over the 1981 – 2012 period, with the real GDP increasing at a mean annual rate of 6.6%. At the end of 1997 and beginning of 1998, a major financial crisis hit the economy (the GDP dropped by 5.7% in 1998). It is often maintained that excessive credit and investment and a poor allocation of financial resources made the economy vulnerable to the crisis (Park and Lee, 2003; Joh, 2003; World Bank, 2000). In response to the crisis, in 1998 and 1999, the government engaged in radical reforms of the corporate and financial sectors. This section describes the reforms that can have affected the fluidity with which the credit market reallocates funds across firms.

3.1 Corporate reforms

Prior to the crisis, Korean non-financial businesses expanded by relying heavily on bank loans and bonds. Firms affiliated to business groups (*chaebols*) benefited from the government's corporate policy that encouraged their growth in the belief that large-scale firms would better compete in global markets (Jwa, 2002). In 1995, the firms affiliated to the top 30 *chaebols* accounted for 16.2% of the Gross National

Product and 41.0% of the value added of the manufacturing sector. In 1997, the median debt-equity ratio of *chaebol*-affiliated firms was almost 400% (Lee and Rhee, 2007).

After the onset of the crisis, the government enacted a reform of the corporate sector. *Chaebol*-affiliated firms were forced to lower their debt-equity ratio below 200% by 1999: the debt-equity ratio of the top 30 *chaebols* dropped to 171.2% in 2000. Debt guarantees among *chaebol* affiliates were abolished: the debt guarantees of the top 30 *chaebols* dropped from 26.9 trillion won in April 1998 to zero in March 2000 (Chang, 2006). Along with these reforms, new accounting principles based on international standards (such as quarterly reporting) were introduced to improve firms' accounting transparency (Jwa, 2002). This enhanced the ability of investors and financial institutions to detect a deteriorating performance of borrowing firms and, hence, cut credit in a more timely way.

3.2 Financial reforms

Prior to the crisis, preferential credit was given to large firms to develop key manufacturing industries.[3] Enjoying little independence in monitoring firms, banks often engaged in a mere renewal of outstanding loans (Haggard, Lim and Lim, 2010).

After the onset of the crisis, new financial supervision criteria, such as capital adequacy regulation and loan classification standards, were introduced. This allegedly altered lending practices. Financial institutions stopped rolling over loans to companies with high debt and became more sensitive to firms' profitability and default risk, increasingly subjecting firms to loan appraisals (Borensztein and Lee, 2005).

[3]Furthermore, the liberalization of financial markets − accelerated since 1993 − enabled firms to borrow from non-bank financial institutions and foreign lenders (Chang, 2006).

3.3 The effects on the credit market

It is commonly agreed that for various years the corporate and financial reforms exacerbated the deleveraging process of the business sector initiated by the crisis (Bank of Korea, 2003). On the demand side of the credit market, the reforms prompted the corporate sector to reduce its debt exposure; on the supply side, they forced financial institutions to apply less inertial lending standards. Figure 1, Panel A, plots the real debt growth rate and real equity issues of Korean non-financial firms, together with the real GDP growth rate, over the 1981−2012 period; Panel B plots the aggregate leverage (debt to GDP) ratio of the Korean business sector. The financial variables are constructed using the Flow of Funds Accounts compiled by the Bank of Korea. The figure clearly illustrates the rapid credit growth before the financial crisis and the credit contraction and deleveraging after the crisis.[4] From the end of 2001, credit to the corporate sector started to increase again, but at a very slow pace. It was only in 2006 that credit growth accelerated.

While insightful, conventional credit aggregates are silent on the dynamic process of reallocation of credit across firms. In particular, they do not allow to discern whether the financial crisis and the associated policy reforms had an impact on the dynamism and flexibility with which the credit market was able to reallocate funds across firms. Thus, conventional credit aggregates are of limited help in disciplining macroeconomic models that focus on the role of the credit market and of firm heterogeneity in the build-up and aftermath of financial crises.

4 Data and methodology

In this section, we describe the data and the measurement of credit reallocation.

[4] The slowdown in the growth of credit to the business sector was partially compensated by an acceleration in loans to households (according to the Bank of Korea, the ratio of corporate loans to total loans shrank from 76% in 1997 to 55% in 2002).

4.1 The data set

To measure inter-firm credit reallocation, we need microeconomic, firm-level data. Our main data source is KISLINE, the business information source of the leading Korean credit rating agency, Korea Investors Service (KIS), which is affiliated with Moody's. KISLINE provides information on financial statements, public disclosures and corporate governance of Korean businesses. Our data set covers all the publicly traded firms as well as all the privately held firms subject to annual external auditing. The Corporate External Audit Law requires all privately held companies whose assets are above a given level and all publicly traded firms to report their annual external audit (including financial statements) to financial authorities. Between 1980 and 2012, to reflect the inflation rate, the asset threshold for privately held firms subject to external auditing was raised four times (the last time in 2009). The coverage of KISLINE implies that our data set covers all the years in which a firm existed during the 1980−2012 period, even if the firm was subject to external auditing only in one year.

We exclude financial firms because we aim at studying the demand side of the credit market. The data set spans 33 years, from 1980 to 2012, and includes 33,463 firms (2,245 publicly traded firms, 31,218 privately held ones) and 373,685 firm-year observations. The firms in the data set account for a very large fraction of economic activity in Korea. They accounted for 49.2% and 56.6% of regular employment of the non-financial sector and of the manufacturing sector in 2000;[5] the bank loans they obtained amounted to 81.61% of the bank loans to all non-financial businesses in 2008. By comparison, the Compustat firms used by Herrera et al. (2011) to document empirical regularities of the inter-firm credit reallocation in the United States roughly account for one third of the employment of non-financial U.S. businesses. The average sales of the privately held firms and publicly traded firms in the sample are 297 million won and 4.6 billion won, respectively. The average total debt equals

[5] Regular employment is here defined as jobs with contracts lasting no less than one year.

223 million won for privately held firms and 2.9 billion won for publicly traded firms.

The long sample period and the extensive coverage enable us to analyze the effects of the 1997 financial crisis on credit reallocation as well as various cross-sectional properties of credit reallocation. Additionally, our data make it possible to analyze separately the reallocation of loans and the reallocation of bonds.

4.2 Measurement

Following Herrera et al. (2011), we define total debt as all forms of financial debt except accounts payable to suppliers. We exclude trade credit because it has properties very different from other kinds of debt. It is for transaction purposes rather than for financial purposes; moreover, it is based on relationships with suppliers rather than with financial institutions. Finally, trade credit is very expensive and firms resort to it only when they do not have access to other forms of finance. These features imply that trade credit has low substitutability with other forms of debt (Rajan and Zingales 1995; Nilsen 2002). In addition to total credit, we investigate long-term credit, loans, and bonds. Long-term credit frequently finances long-term investment plans. Loans and bonds, in turn, may exhibit different dynamics, for example because the financial reforms implemented in response to the Korean crisis mostly targeted loan-granting institutions, such as banks.

We need to discuss a few methodological issues in the measurement of credit reallocation. A first issue regards firm entry and exit. KISLINE provides information on all the years in which a firm existed during the sample period and identifies precisely newborn firms and dying firms. Following Herrera et al. (2011), and in line with Ramey and Shapiro (1998), we treat firms that exit due to bankruptcy, liquidation, or merger and acquisition, as dying firms.[6] A second issue is the mis-

[6] There is a strong reason to treat the exit of a merged or acquired firm as a credit subtraction. When two firms merge, the management and workforce of either acquire control over the financial resources of the other. For financiers this is at least partly equivalent to reallocating credit between two firms. In fact, many studies (e.g., Servaes, 1991) find that the announcement of a merger

match between fiscal year and calendar year that occurs in roughly 5% of the firms in the sample. Following the way Compustat addresses this mismatch problem, if the fiscal year ends after May 31st, the data of the firm are not reallocated as if there was no mismatch problem. If, instead, the fiscal year ends before May 31st, the data are allocated to the previous year. Alternatively, we address this issue by apportioning fiscal year data proportionally to calendar years; this leads to virtually identical results. Lastly, we deflate all the original variables using the implicit GDP deflator in order to study credit reallocation in real terms and relate its dynamics with that of real aggregate variables.

To measure credit reallocation, this paper replicates the methodology proposed by Davis and Haltiwanger (1992) for measuring job reallocation and employed by Herrera et al. (2011) for measuring credit reallocation in the United States. Let c_{ft} denote the average debt of firm f between year *t-1* and year t and C_{st} denote the average debt of set s of firms between year *t-1* and year t. The debt growth rate g_{ft} of firm f is obtained by dividing the change in debt from year *t-1* to year t by c_{ft}. This growth rate takes values in the $[-2, +2]$ interval and has the advantages of symmetry and boundedness (for more on its statistical properties, see Davis and Haltiwanger, 1992, and Törnqvist, Vartia and Vartia, 1985). If a firm is born, its debt growth rate takes the value of $+2$; if it dies, its debt growth rate takes the value of -2.

Five aggregate credit flows are constructed using firms' debt growth rates. Credit creation (POS_{st}) is the sum of the debt growth rates of the firms with growing debt weighted by their debt size (the firm debt average over the subsample's debt average). Credit destruction (NEG_{st}) is the sum of the debt growth rates of the firms with shrinking debt weighted by their debt size. The third measure, gross credit reallocation (SUM_{st}), is the sum of credit creation and credit destruction.[7]

significantly affects the stock market value of target and acquirer, suggesting that mergers have large real effects.

[7]Since credit creation and destruction are generated with annual data, they do not capture

Net credit growth (NET_{st}) is constructed as credit creation less credit destruction. The last measure, excess credit reallocation (EXC_{st}), is computed as gross credit reallocation less the absolute value of the net credit growth. That is, EXC_{st} measures credit reallocation in excess of the minimum required to accommodate the net credit change. These five credit flows can be written as follows:

$$\text{POS}_{st} = \sum_{\substack{f \in s_t \\ g_{ft} > 0}} g_{ft} \left(\frac{c_{ft}}{C_{st}} \right), \tag{1}$$

$$\text{NEG}_{st} = \sum_{\substack{f \in s_t \\ g_{ft} < 0}} |g_{ft}| \left(\frac{c_{ft}}{C_{st}} \right), \tag{2}$$

$$\text{SUM}_{st} = \text{POS}_{st} + \text{NEG}_{st}, \tag{3}$$

$$\text{EXC}_{st} = \text{SUM}_{st} - |\text{NET}_{st}|, \tag{4}$$

$$\text{NET}_{st} = \text{POS}_{st} - \text{NEG}_{st}. \tag{5}$$

5 Credit reallocation, credit boom, deleveraging

This section studies the magnitude of credit reallocation before and after the crisis.

5.1 Intensity of credit reallocation

Panel A of Figure 2 plots the annual gross credit reallocation (SUM), excess credit reallocation (EXC), and net credit growth (NET) together with the real GDP growth rate for the period 1981 to 2012. Panel B plots credit creation (POS) and credit destruction (NEG). Table 1 shows the average annual flows of credit for the 1981−2012 period and for the pre-crisis (1981−1996) and post-crisis (1999−2012) sub-periods. It also shows the average credit flows for two shorter sub-periods: the credit boom

changes of credit during a year. Thus, they constitute lower bounds on the true credit creation and destruction.

(1993−1996) and the deleveraging phase (1999−2004). Over the 1981−2012 period, the annual net credit change equalled 6.9% on average. Between 1981 and 1996, credit grew at a mean annual rate of 9.6%. Credit growth was especially rapid between 1993 and 1996, originating a credit boom (average credit growth of 10.3%). After the crisis, credit growth dropped dramatically, averaging −2.7% between 1999 and 2004 (deleveraging phase) and 3.0% between 1999 and 2012.

A deleveraging of the business sector can be achieved through a reduction in the rate of credit creation and a relatively stable credit destruction, thus implying lower credit reallocation. Alternatively, it can be attained through a relatively stable credit creation and an increase in credit destruction, thus entailing higher credit reallocation. Korea followed the latter path. As Table 1 shows, over the whole sample period the average annual credit creation and destruction were 14.18% and 7.25%, respectively; the average annual credit reallocation equalled 21.42%. Credit destruction surged significantly during the crisis and thereafter remained permanently higher than in the pre-crisis period: the average credit destruction was 4.16% before the crisis (1981−1996) and more than double (10.86%) after it (1999−2012). Credit creation dropped during the crisis but reverted back to the pre-crisis level (about 14%) after the crisis. As a result of these patterns of credit creation and destruction, gross credit reallocation significantly increased after the crisis, rising from an average annual rate of 17.89% in the pre-crisis (1981−1996) period (17% during the credit boom of 1993−1996) to an average of 24.70% in the post-crisis (1999−2012) period (25% during the 1999−2004 deleveraging period).[8] Figure 2, Panel A, makes clear that one should not be misled by the tendency of the gross reallocation of credit to increase already in the very last phase of the credit boom (between 1995 and 1996): in fact, this was only due to the need to accommodate the acceleration in credit growth. The behavior of the excess credit

[8] The average magnitude of gross credit reallocation over the full sample is of the same order as that found by Herrera et al. (2011) for U.S. non-financial businesses over the 1952−2007 period. However, the net credit change is higher than that of the U.S. business sector.

reallocation is particularly telling in this respect: the average annual excess credit reallocation was 8.31% between 1981 and 1996, and it actually slowed down to 6.98% during the credit boom. After the crisis, due to the significant increase in gross credit reallocation and the drop in net credit growth, excess credit reallocation rose sharply, equalling 18.99% on average between 1999 and 2012. Altogether, the behavior of credit reallocation and of the net credit change reveal that the credit boom was characterized by a depressed excess reallocation of credit. By contrast, the creditless recovery (deleveraging) after the crisis was characterized by an intensification of the reallocation of credit that has persisted since then.

We performed Chow tests to assess formally the presence of a structural break in the credit flows in 1998. The results, shown in Table 1, suggest that there was a structural break in credit destruction, net change, gross and excess reallocation between the pre-crisis and the post-crisis period, while there was no structural break in credit creation. A concern with Chow tests might be that they require to posit the breakpoint. To assuage this possible concern, following the approach of Stock and Watson (2003), we specified an AR(1) process for the conditional mean of credit reallocation. We then used the Quandt Likelihood Ratio (QLR) test statistic, also known as the sup-Wald statistic, to test whether the conditional mean of the AR(1) process had a structural break at some unknown date. We obtained evidence of a structural break of the excess credit reallocation in 1999 (with a significance level of 1%). The 67% confidence interval for the break date is between 1997 and 2001.[9] Furthermore, we compare the mean of the credit flows between the pre-crisis period (1981−1996) and the post-crisis period (1999−2012) using rank sum tests. The results in Table 1 again suggest that, except for credit creation, the means of the credit flows differ between the two periods.

An appealing feature of our data is that they allow to disentangle the reallocation of loans from that of bonds (see Table 1 and Figure 3). After the crisis the inter-

[9] The Quandt test results are available from the authors.

firm gross reallocation of loans rose significantly while the gross reallocation of bonds remained stable; if we look at the excess reallocation, we observe that the excess loan reallocation rose much more sharply than the excess bond reallocation. This stems from the fact that both loan creation and loan destruction rose while the increase in bond destruction was largely offset by the decrease in bond creation. To summarize, gross and excess credit reallocation have significantly intensified after the crisis, and this has especially been due to the higher dynamism in the reallocation of loans.

5.2 Size and persistence of underlying credit changes

A broad literature demonstrates that, because of non-convex adjustment costs, businesses prefer adjusting labor and capital in a lumpy way (see, e.g., Davis, Faberman and Haltiwanger, 2006). Recent studies suggest the presence of analogous non-convex adjustment costs in credit changes (Eisfeldt and Muir, 2013; Bazdresch, 2013). It is then important to understand to what degree the intensification of credit reallocation after the crisis was driven by large credit changes at the firm level. The definition of what constitutes a large credit change is somewhat arbitrary. For physical capital, Gourio and Kashyap (2007) define large capital changes (investment spikes) as those exceeding 20%. Following their approach, and in line also with Herrera et al. (2011), we label a firm's debt growth rate g_{ft} exceeding 18% (corresponding to a 20% canonical growth rate) as a large credit increase; and we label a debt growth rate g_{ft} below -18% as a large credit decrease. Next, using the methodology above, we calculate the credit creation due to large credit increases (POSbig_{st}) and the credit destruction due to large credit decreases (NEGbig_{st}). Based on these two measures, we then compute the gross and excess credit reallocation (SUMbig_{st} and EXCbig_{st}) and the net credit growth (NETbig_{st}) due to large credit changes. Table 2 and Figure 4 display the annual credit flows attributable to large credit changes; in the table, numbers in parentheses are the mean shares of credit flows due to large changes. On average, between 1981 and 2012 the share

of gross credit reallocation due to large credit changes equalled 76.80%. This share actually rose from 72.09% before the crisis to 80.94% after the crisis. Thus, a substantial portion of the increase in credit reallocation is attributable to large credit adjustments.

Credit changes could be large but reflect short-lived liquidity shortfalls of the firms. To check whether the intensification of credit reallocation after the crisis was driven by temporary debt changes, we assess the persistence of firms' debt changes using the index proposed by Davis and Haltiwanger (1992)

$$\mathbf{P}_{ft} = \min\left[1, \max\left(0, \frac{g_{ft,t+2}}{g_{ft,t+1}}\right)\right] \tag{6}$$

where $g_{ft,t+2}$ and $g_{ft,t+1}$ are the debt growth rate of a firm f between year t and year *t+2* and the debt growth rate between year t and year *t+1*, respectively. The maximum persistence, equivalent to P_{ft}=1, occurs when all the debt change of the firm from t to *t+1* lasts until *t+2*; P_{ft}=0 means instead that the debt change is purely temporary. In the full sample period, the unweighted average value of P_{ft} was 0.71. The average value of the index remained materially unchanged after the crisis (equalling 0.72 before the crisis, 0.70 after it). This indicates that the firm-level debt changes underlying the credit flows were persistent both before and after the crisis and that the intensification of credit reallocation after the crisis was not due to temporary liquidity shortfalls of the firms.

5.3 The role of flights to quality

The literature on the interaction between the credit market and the macroeconomy has showed that, following negative aggregate shocks, financiers contract credit to information opaque borrowers, such as small firms, while they accommodate the increasing credit demand of information transparent borrowers, such as big firms (Bernanke, Gertler and Gilchrist, 1999, 1996). This would induce a reshuffling of credit (flight to quality) from small to big firms. Similarly, following negative aggregate shocks, credit can flow from industries suffering from tight credit conditions to

industries less exposed to tight credit. The reader may then wonder to what extent the intensification of credit reallocation we have uncovered reflects a flight to quality triggered by the financial crisis and that persisted after the crisis.

To probe this point, we break down our sample based on five group categories: size classes (sales quintiles), two-digit SIC industries, *chaebol*-affiliation, locations (regions), and access/lack of access to the equity market. For each classification, we measure the relative importance of the reallocation of credit within groups (e.g., size classes) using the "within index" put forth by Davis and Haltiwanger (1992)

$$\mathbf{W}_t \ = 1 - \frac{\sum |\mathrm{NET}_{jt}|}{\sum \mathrm{SUM}_{jt}}, \tag{7}$$

where j denotes a group. W_t =1 if credit reallocation across groups does not occur and all the reallocation is within groups; $\mathrm{W}_t = 0$ if reallocation within groups does not occur and all credit reallocation occurs across groups.

Table 3 displays the results when we partition the sample into size classes (sales quintiles). Credit reallocation decreases monotonically with size (see Panel A). For instance, the average gross credit reallocation rates for the 1st sales quintile (smallest firms) before and after the crisis were 23.65 and 33.38, respectively, larger than 16.11 and 21.86 for the 5th quintile (largest firms).[10] The average W_t for sales quintiles was 0.57 and rose from 0.44 in the pre-crisis (1981−1996) period to 0.73 in the post-crisis (1999−2011) period (see Panel B). In unreported tables, we also partition firms into two-digit SIC industries. The intensity of credit reallocation exhibits considerable variation across industries. With the exception of few industries, such as electronic components and motor vehicles, in all industries credit reallocation increased after the crisis, fueled mainly by an increase in credit destruction. If we focus on manufacturing industries, the average W_t was 0.52 between 1981 and 2012, and, again, rose significantly from 0.43 in the pre-crisis period to 0.63 in the post-crisis period (see Panel B). Next, we partition the sample into 16 regions based on the Korean administrative districts (7 metropolitan cities and 9 provinces). We

[10] However, such a monotonic pattern cannot be observed for loans and bonds separately.

identify a firm's location using the headquarter address reported by KISLINE. The average W_t rose from 0.40 in the pre-crisis period to 0.67 in the post-crisis period, suggesting that the share of credit reallocation across regions shrank after the crisis. Finally, in South Korea a relevant classification is that between chaebol and non-chaebol firms. When we split firms based on whether they are affiliated or not to one of the top 30 *chaebols*, we obtain again that the average W_t rose after the crisis.

Altogether, these results suggest that after the crisis the importance of credit reallocation within roughly homogeneous groups of firms increased relative to the importance of credit reallocation across groups. Does this imply that no flight to quality (e.g., no reshuffling of credit across size classes of firms or across industries) occurred during the crisis? Actually, the increase in the W-index occurred after a drop during the crisis. For instance, the drop of the W-index for sales quintiles in 1997 (see Table 3, Panel B) suggests that the crisis was indeed characterized by a reshuffling of credit from risky and informationally opaque small firms to safer and informationally transparent large firms. In particular, the reshuffling would have largely occurred in the loan market (the W-index for bonds remained roughly unaltered during the crisis).[11] Nonetheless, the increase of the W-index after the crisis strongly suggests that the significant intensification of credit reallocation after the crisis does not reflect temporary flights to quality but a structurally higher fluidity of the credit market in reallocating funds.

6 Dynamic pattern of credit reallocation

We have found that the intensity of credit reallocation rose significantly after the 1997 financial crisis. We now turn to examine whether the dynamic pattern of credit reallocation also changed after the crisis.

[11] See Gertler and Gilchrist (1993) for an analysis of flights to quality involving a reshuffling of loans from small to large firms.

6.1 Volatility

Table 4, Panel A, reports three measures of volatility of credit flows: the standard deviations of the original flows and of the Hodrick-Prescott filtered flows as well as the coefficient of variation (standard deviation/mean*100) of the original flows. The volatility of credit reallocation is pronounced: over the full sample period the coefficients of variation equal 22.64% for gross credit reallocation and 49.96% for excess credit reallocation. Similar to what found by Herrera et al. (2011) for the United States, credit destruction is more volatile than credit creation (coefficient of variation of 59.96% versus 31.73%). The volatilities of credit creation, credit destruction, net credit change, gross and excess credit reallocation consistently increased after the financial crisis. We also computed the rolling standard deviations of gross credit reallocation using 5-year and 10-year moving windows. The results (gathered in the Supplement) confirm that the volatility of credit reallocation rose after the crisis.

As noted, the relative importance of credit reallocation within industries and size classes grew after the crisis. A related question is to what extent the increase in the volatility of credit reallocation was driven by idiosyncratic, firm-level debt changes. To assess this, we decompose the debt growth rate of each firm into the sector growth rate and an idiosyncratic, firm-level component. Next, we recompute the credit flows in (1)−(5) using only the idiosyncratic component. Finally, we decompose the variance of each credit flow into three parts, the variance caused by idiosyncratic effects, the variance caused by sectoral or aggregate effects, and the covariance term. For instance, for gross credit reallocation

$$\text{var}(\text{SUM}_\text{t}) = \text{var}(\text{SUM}_t^i) + \text{var}(\text{SUM}_t - \text{SUM}_t^i) + 2\text{cov}(\text{SUM}_t - \text{SUM}_t^i, \text{SUM}_t^i), \quad (8)$$

where $\text{SUM}_t{}^i$ denotes gross credit reallocation driven by idiosyncratic effects in year t. Table 5 summarizes the relative contribution of idiosyncratic effects and of sectoral or aggregate effects to the variance of credit flows. Across classification schemes, we generally find that the relative importance of sectoral or aggregate effects in the

volatility of credit reallocation tended to shrink after the crisis while the importance of idiosyncratic effects rose. Using the classification in size classes (sales quintiles), for example, we obtain that before the crisis the contribution of idiosyncratic effects to the variance of the reallocation of loans was equal to the contribution of sectoral or aggregate effects. After the crisis, the relative contribution of idiosyncratic effects rose significantly.

6.2 Cyclical behavior

To examine the cyclical pattern of credit flows, we start by computing unconditional correlation coefficients between the credit flows and the GDP.

6.2.1 Unconditional correlations

We extract cyclical components from the series using the Hodrick-Prescott filter. Table 4, Panel B, gathers the pairwise coefficients of correlation between the cyclical components of the credit flows and the cyclical components of real GDP. Since 2008 appears to be somewhat an outlier, driven by a program of credit subsidies, we also present correlation coefficients excluding 2008. Over the 1981−2012 period, credit creation was procyclical, while credit destruction was countercyclical. Gross credit reallocation exhibited a mildly procyclical pattern.[12] Interestingly, when we split gross credit reallocation into its components (the absolute value of the net credit change and the excess credit reallocation − see (4)), we find that the forces driving the cyclical behavior of gross credit reallocation changed after the crisis (see again Table 4, Panel B). While before the crisis credit growth exhibited a procyclical behavior and the excess credit reallocation was essentially acyclical, after the crisis the patterns flipped, with credit growth becoming almost acyclical and the excess credit reallocation becoming procyclical.

[12] Herrera et al. (2011) find that gross credit reallocation is mildly procyclical in the United States.

Formally, in Table 6 we decompose the correlation of gross credit reallocation with the GDP using the following formula[13]

$$\text{corr}(\text{SUM}, \text{GDP}) = \frac{\text{sd}(\text{EXC})}{\text{sd}(\text{SUM})}\text{corr}(\text{EXC}, \text{GDP}) + \frac{\text{sd}(|\text{NET}|)}{\text{sd}(\text{SUM})}\text{corr}(|\text{NET}|, \text{GDP}). \quad (9)$$

The results of the decomposition confirm that the comovement of gross credit reallocation with the business cycle was especially driven by the net credit change before the crisis and by the excess credit reallocation after it. Naturally, this finding does not inform us about causality. However, it is suggestive, as the years of GDP expansion leading up to the crisis featured a credit boom whereas after the crisis, during the years of deleveraging, an enhanced dynamism of the credit market in reallocating funds was associated with the recovery of economic activity.

To conclude, the reader might have some concern that for the post-crisis period the analysis of the dynamic behavior of credit flows relies on annual data from 1999 to 2012. While higher frequency data for the whole sample period are not available, we have quarterly data for publicly traded firms for essentially the whole post-crisis period (from 2000Q1 to 2012Q4). We then recomputed the credit flows using these quarterly data and examined their correlation with the GDP. The findings (gathered in the Supplement) confirm that after the crisis excess credit reallocation exhibited a procyclical behavior; by contrast, credit growth was slightly countercylical. As a robustness analysis, following Den Haan (2000), we also estimated a VAR with the quarterly data and computed the correlation of VAR forecast errors at different horizons. The results (available from the authors) confirmed the cyclical pattern of the credit flows inferred from unconditional correlations.

6.2.2 Conditional correlation

Unconditional correlations do not control for microeconomic variables that may affect credit flows. To address this issue, we adopt the approach of Covas and Den

[13] In order to perform the decomposition in (9), we do not apply the Hodrick-Prescott filter but consider the original series.

Haan (2011). We estimate the following firm-level regression

$$\begin{aligned}\frac{F_{i,t}}{A_{i,t-1}} &= \alpha_{0,i} + \sum_{j=1}^{J} \mathbf{I}_{i,t}(j)\{\alpha_{j,1}t + \alpha_{j,2}t^2 + \alpha_{j,3}Y_t^c + \\ &\quad \alpha_{j,4}(\frac{CF_{i,t-1}}{A_{i,t-2}} - \frac{\overline{CF}_{j,t-1}}{A_{i,t-2}}) + \alpha_{j,5}(Q_{i,t-1} - \overline{Q}_{j,t-1})\} + u_{i,t} \qquad (10)\end{aligned}$$

where $F_{i,t}$ is the debt change of firm i in year t; $A_{i,t-1}$ denotes the total assets of the firm in year $t-1$; t and t^2 denote a linear and a quadratic time trend, respectively; $\mathbf{I}_{i,t}(j)$ is an indicator variable that takes the value of one if firm i belongs to the group j of firms (e.g., a sales quintile), zero otherwise; and Y_t^c is the measure of the cycle, the HP-filtered GDP. Following Covas and Den Haan (2011), we insert lagged values of firm cash flow ($CF_{i,t-1}$) and Tobin's Q ($Q_{i,t-1}$) as independent variables. For unlisted firms, since we lack information on the Tobin's Q, we use the two-year-ahead sales growth rate as a proxy. Due to data availability, the sample spans from 1987 to 2012 and the number of firm-year observations is 145,026 (data for cash flows and Tobin's Q are not available before 1987). The HP-filtered GDP is scaled to be zero at its minimum observed value and one at its maximum observed value. This enables us to interpret its estimated coefficient as the change in credit when the economy goes from through to peak over the business cycle. Moreover, we subtract the group mean from the cash flow and the Tobin's Q (respectively, $\overline{CF}_{j,t-1}$ and $\overline{Q}_{j,t-1}$) to purge the effect of aggregate conditions on independent variables.

Table 7 reports the estimation results separately for each sales quintile and for chaebol and non-chaebol firms. To conserve space, we only display the coefficient estimates for the HP-filtered GDP, $\alpha_{j,3}$, and the Tobin's Q, $\alpha_{j,5}$. As demonstrated by Covas and Den Haan (2011), it is useful to distinguish firms of different size when studying the cyclical behavior of their debt. The results confirm the reduced procyclicality of the net credit change documented above with the unconditional correlation coefficients: after the crisis, firm-level debt changes became less sensitive to the cycle in all size classes of firms except the very large ones (5th sales quintile).

7 Credit reallocation and efficiency

In this section, we take a step towards investigating whether the intensification of credit reallocation after the financial crisis was associated with enhanced efficiency of the credit reallocation process. We adapt to our context the index for the efficiency of investment allocation proposed by Galindo, Schiantarelli and Weiss (2007). As in their analysis, we use the firm ratios of operating profits to capital and sales to capital as proxies for firm productivity and efficiency.[14] Using these proxies, we then construct an index to evaluate the efficiency of the allocation of credit.

The index is a ratio. In the numerator, in year t, the ratio includes the weighted sum of the sales (or profits) to capital ratios of the firms, with the weight for each firm given by the contribution of the firm debt to the total debt of the firms in that year (c_{ft}/C_t). In the denominator, the ratio includes the sum of the sales (or profits) to capital ratios of the same firms weighted by the contribution of the firm debt to the total debt of the firms in the previous year (c_{ft-1}/C_{t-1}). For example, when using the sales to capital ratio (s_{ft}/k_{ft}) of the firms to measure their productivity, the index reads

$$\mathbf{I}_t = \frac{\sum_f \frac{\mathrm{s}_{ft}}{\mathrm{k}_{ft}} \frac{\mathrm{c}_{ft}}{\mathrm{C}_t}}{\sum_f \frac{\mathrm{s}_{ft}}{\mathrm{k}_{ft}} \frac{\mathrm{c}_{ft-1}}{\mathrm{C}_{t-1}}}. \tag{11}$$

A value of the index greater than one signals that credit was allocated more efficiently in year t than if the credit distribution had remained as in year $t-1$.

Table 8 reports the average value of the efficiency index $\mathbf{I}_t$ for the pre-crisis and post-crisis periods (the table also reports the value of the index obtained using loans instead of total credit in (11) as well as the value of the index for each sales quintile and for chaebol and non-chaebol firms). Figure 5 plots the values of the

[14] There are several reasons to use both sales and profits (see also Galindo et al., 2007). Sales are measured more accurately than operating profits. Moreover, profits are highly correlated with cash flow. Because cash flow is the main source of internal financing, a relationship between cash flow and a change in debt may bias the index. Lastly, operating profits are more volatile than sales.

index (squares for the index constructed using sales to capital ratios, circles for the index constructed using profits to capital ratios) together with quadratic fitted lines. The figure suggests that in the years preceding the crisis the efficiency of the credit reallocation process frequently dropped (the values of the index are often below one). The efficiency of credit reallocation then jumped up after the crisis and the associated reforms and continued to improve, though less sharply, in the following years (values of the index above one). The figure also shows that the pattern of the index tracks that of gross and excess credit reallocation. Table 8, in turn, reveals that the increase in the efficiency of credit reallocation was most pronounced for chaebol firms. This corroborates the idea that the policy reforms and the enhanced dynamism of credit reallocation reduced the tendency to roll over credit to inefficient chaebol-affiliated and government-protected firms.

8 Conclusion

This paper has investigated the effect of a financial crisis and of the associated corporate and financial reforms on the continuous dynamic process of inter-firm credit reallocation. We have found that during the credit boom that preceded the 1997 Korean crisis, the intensity of credit reallocation was depressed. By contrast, after the crisis and the reforms enacted in response to it, credit reallocation rose significantly, while credit growth slowed down (deleveraging). The staggering increase in the intensity of credit reallocation cannot be explained by episodes of "flight to quality" but reflects a structurally higher flexibility of the credit market in reallocating liquidity across firms. The analysis has further revealed that before the crisis credit growth comoved with the business cycle more than excess credit reallocation, while after the crisis excess credit reallocation was more procyclical than credit growth. Finally, we have uncovered evidence that the increase in the intensity of credit reallocation was associated with enhanced efficiency in the credit reallocation process.

A large body of research has recently investigated the behavior of credit growth before and after financial crises, focusing on the credit boom-and-busts often associated with the crises. All in all, our results suggest that financial crises and the subsequent reforms can play a pivotal role not only in the dynamics of aggregate credit growth but also in the fluidity with which the credit market continuously reallocates funds across firms. A credit boom characterized by a depressed dynamism in the credit reallocation process could be very different from a credit boom characterized by a fluid process of reallocation of liquidity. Similarly, a creditless recovery characterized by increased dynamism in the reallocation of credit across businesses could spur growth, despite the overall lower volume of liquidity flowing to the business sector. Constructing heterogeneous-firms models of the credit market that reproduce the behavior of credit reallocation documented in this analysis can further our understanding of the build-up and aftermath of financial crises.

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Table 1. Magnitude of Gross Flows

Variable	Period	POS	NEG	SUM	NET	EXC
Total credit	81-12	14.177	7.246	21.423	6.930	13.216
	81-96	13.730	4.157	17.887	9.573	8.314
	93-96	13.768	3.491	17.258	10.277	6.981
	99-04	11.189	13.856	25.045	-2.668	22.070
	99-12	13.840	10.855	24.696	2.985	18.986
	Chow test	0.196	2.315	1.899	2.570	3.983
	Rank sum	0.748	-4.448	-4.115	2.827	-4.448
Long-term credit	81-12	18.255	11.090	29.346	7.165	20.222
	81-96	17.754	8.087	25.841	9.667	15.929
	93-96	17.051	6.395	23.446	10.655	12.790
	99-04	15.791	18.343	34.134	-2.552	28.292
	99-12	17.979	14.709	32.688	3.269	25.501
	Chow test	0.050	6.160	1.099	3.429	6.110
	Rank sum	0.042	-3.575	-3.035	2.245	-3.326
Loans	81-12	18.946	12.682	31.628	6.263	22.000
	81-96	16.481	8.185	24.666	8.296	15.477
	93-96	17.089	7.344	24.433	9.745	14.688
	99-04	16.547	22.497	39.045	-5.950	31.652
	99-12	20.639	18.090	38.730	2.549	29.954
	Chow test	-2.536	-3.908	-4.656	1.538	-4.282
	Rank sum	-2.536	-3.908	-4.656	1.538	-4.282
Bonds	81-12	22.066	11.718	33.784	10.349	21.040
	81-96	25.146	9.501	34.648	15.645	18.912
	93-96	19.737	5.224	24.961	14.513	10.448
	99-04	16.413	18.108	34.521	-1.695	25.691
	99-12	18.238	14.549	32.787	3.688	24.086
	Chow test	3.184	2.262	0.648	3.961	1.239
	Rank sum	2.993	-2.702	0.831	3.118	-1.912

Notes: This table reports the average flows of total credit, long-term credit, loans, and bonds. The period 1981 to 1996 and the period 1999 to 2012 reflect the pre-crisis period and the post-crisis one, respectively.

Table 2. Gross Flows due to Large Credit Changes

Variable	Period	POSbig	NEGbig	SUMbig	NETbig	EXCbig
Total credit	81-12	11.507	5.250	16.757	6.257	9.676
		(80.006)	(66.988)	(76.800)	(76.940)	(67.939)
	81-96	10.693	2.304	12.997	8.389	4.608
		(77.166)	(55.325)	(72.093)	(88.193)	(55.325)
	93-96	10.331	1.957	12.288	8.374	3.914
		(73.809)	(57.379)	(70.195)	(81.541)	(57.379)
	99-04	9.258	11.233	20.492	-1.975	18.300
		(82.358)	(79.545)	(80.765)	(56.968)	(82.564)
	99-12	11.674	8.533	20.206	3.141	15.235
		(81.945)	(79.325)	(80.942)	(67.035)	(80.759)
Long-term credit	81-12	16.160	9.122	25.282	7.038	16.585
		(87.571)	(78.894)	(85.090)	(91.838)	(79.082)
	81-96	15.496	5.959	21.455	9.536	11.700
		(86.459)	(71.228)	(82.116)	(99.966)	(71.244)
	93-96	14.395	4.608	19.003	9.786	9.217
		(83.934)	(72.411)	(80.742)	(91.977)	(72.411)
	99-04	13.791	16.601	30.392	-2.810	24.934
		(88.774)	(87.471)	(88.055)	(84.874)	(88.432)
	99-12	15.984	12.816	28.800	3.168	22.088
		(88.134)	(86.696)	(87.648)	(81.108)	(87.108)
Loans	81-12	16.968	10.794	27.763	6.174	18.536
		(88.670)	(80.229)	(86.507)	(91.866)	(80.227)
	81-96	14.134	6.078	20.211	8.056	11.418
		(85.357)	(71.650)	(81.648)	(84.919)	(71.661)
	93-96	14.475	5.218	19.693	9.257	10.436
		(84.277)	(70.030)	(80.470)	(117.097)	(70.030)
	99-04	15.735	20.630	36.365	-4.895	30.042
		(91.551)	(91.511)	(91.508)	(88.066)	(91.830)
	99-12	19.589	16.082	35.672	3.507	27.357
		(91.992)	(89.885)	(91.352)	(99.250)	(90.021)
Bonds	81-12	19.920	10.109	30.028	9.811	17.714
		(88.347)	(82.598)	(87.785)	(100.028)	(81.116)
	81-96	23.070	7.872	30.942	15.198	15.635
		(90.645)	(78.196)	(88.121)	(93.594)	(78.145)
	93-96	17.171	3.296	20.467	13.875	6.592
		(87.159)	(64.246)	(81.943)	(97.441)	(64.246)
	99-04	11.342	17.832	29.173	-6.490	22.684
		(83.337)	(91.537)	(88.471)	(141.954)	(83.337)
	99-12	14.744	13.207	27.951	1.536	20.817
		(84.813)	(87.543)	(86.678)	(107.728)	(84.214)

Notes: This table reports the average flows due to large credit changes. Numbers in parentheses indicate the shares of total flows due to large changes. The period 1981 to 1996 and the period 1999 to 2012 reflect the pre-crisis period and the post-crisis one, respectively.

Table 3. Credit Reallocation in Sub-groups

		Total Credit					Loans					Bonds				
Panel A: Credit reallocation in sales quintiles																
Quintile	Period	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC
1st	81-12	19.981	7.905	27.885	12.076	15.809	23.281	10.838	34.119	12.443	20.397	41.767	29.185	70.952	12.583	40.988
	81-96	18.506	5.148	23.654	13.359	10.296	21.735	8.807	30.542	12.928	15.058	39.072	17.241	56.314	21.831	30.734
	93-96	15.381	5.607	20.988	9.775	11.214	18.615	7.293	25.908	11.322	14.586	33.995	22.439	56.434	11.556	43.823
	99-04	24.172	11.057	35.229	13.115	22.114	27.950	12.937	40.887	15.013	25.874	54.449	47.270	101.719	7.178	49.169
	99-12	22.059	11.321	33.380	10.738	22.642	25.488	13.377	38.866	12.111	26.754	47.748	40.108	87.856	7.641	52.430
	Chow test	1.311	25.867	9.223	1.303	25.867	1.072	1.974	2.166	0.134	9.498	0.178	19.080	8.969	1.888	9.237
	Ranksum	-1.580	-4.490	-3.533	1.122	-4.490	-1.455	-4.032	-3.076	0.582	-4.032	-0.374	-3.243	-2.827	1.164	-2.661
2nd	81-12	17.435	7.510	24.944	9.925	14.809	21.532	11.161	32.692	10.371	20.541	36.148	22.724	58.872	13.424	36.144
	81-96	16.636	5.009	21.645	11.627	9.905	19.989	9.459	29.448	10.529	15.857	34.171	14.466	48.636	19.705	26.352
	93-96	16.505	5.009	21.514	11.496	10.017	22.267	8.421	30.687	13.846	16.841	27.082	15.720	42.802	11.363	31.439
	99-04	17.408	13.098	30.506	4.309	25.382	20.366	15.838	36.204	4.528	30.344	49.382	36.554	85.935	12.828	56.916
	99-12	18.380	10.314	28.694	8.066	20.279	23.059	13.273	36.332	9.786	25.974	41.310	30.528	71.838	10.782	47.974
	Chow test	0.490	13.536	5.178	1.657	13.337	1.227	1.486	3.057	0.003	8.779	0.115	12.820	4.911	1.839	13.640
	Ranksum	-1.039	-3.991	-2.411	1.829	-4.032	-1.330	-3.367	-2.370	1.122	-3.409	-0.915	-3.118	-2.744	0.956	-3.159
3rd	81-12	15.125	7.263	22.388	7.863	13.916	20.962	12.027	32.989	8.935	21.975	24.624	17.331	41.955	7.293	26.185
	81-96	15.325	4.710	20.035	10.616	9.419	18.832	9.603	28.435	9.229	16.375	30.782	10.856	41.638	19.925	20.810
	93-96	14.587	3.571	18.158	11.016	7.142	20.800	6.754	27.554	14.046	13.507	20.901	6.066	26.967	14.835	12.133
	99-04	13.491	11.855	25.346	1.637	22.867	22.569	20.288	42.856	2.281	37.156	17.191	26.434	43.626	-9.243	30.523
	99-12	14.508	10.057	24.565	4.451	19.073	22.653	14.870	37.523	7.783	28.275	18.859	24.919	43.777	-6.060	33.430
	Chow test	0.064	15.629	5.915	4.028	14.688	3.342	2.310	7.677	0.002	8.443	5.406	8.891	0.017	14.998	2.402
	Ranksum	0.998	-3.866	-2.868	2.827	-3.866	-1.788	-2.993	-2.993	0.956	-3.284	2.245	-3.450	-0.166	3.866	-2.162
4th	81-12	16.423	6.669	23.092	9.754	13.164	20.497	11.071	31.568	9.426	20.901	27.672	16.386	44.058	11.286	27.834
	81-96	16.785	4.228	21.013	12.557	8.456	19.542	8.574	28.116	10.968	15.206	25.531	9.416	34.947	16.115	18.695
	93-96	18.982	2.546	21.528	16.436	5.092	23.552	5.490	29.042	18.062	10.979	17.271	6.941	24.212	10.329	13.883
	99-04	12.802	11.569	24.371	1.233	22.210	19.174	17.474	36.648	1.700	33.512	18.999	20.990	39.989	-1.991	22.018
	99-12	15.690	9.518	25.208	6.172	18.639	21.528	14.226	35.754	7.302	27.836	30.303	24.291	54.595	6.012	37.452
	Chow test	0.084	16.381	9.210	3.747	17.512	1.287	3.885	7.463	0.426	10.425	0.565	14.848	6.951	2.653	6.331
	Ranksum	0.873	-4.240	-2.411	2.827	-4.240	-0.748	-3.409	-2.952	1.538	-3.617	-1.206	-3.908	-3.035	1.455	-2.993
5th	81-12	13.017	6.183	19.200	6.834	10.733	17.819	12.284	30.103	5.534	19.472	21.391	10.721	32.111	10.670	19.204
	81-96	12.639	3.472	16.111	9.168	6.943	15.443	7.502	22.944	7.941	13.793	24.282	9.114	33.396	15.168	18.228
	93-96	12.241	2.392	14.633	9.850	4.784	14.941	6.981	21.923	7.960	13.206	19.161	4.317	23.478	14.844	8.634
	99-04	9.452	12.902	22.354	-3.450	18.033	15.161	22.902	38.063	-7.740	27.809	12.236	18.137	30.373	-5.900	24.472
	99-12	12.638	9.221	21.859	3.418	15.022	19.864	17.640	37.505	2.224	26.859	16.206	13.343	29.549	2.864	21.572
	Chow test	0.2632	10.974	14.2851	1.5706	14.4455	3.8285	12.3115	8.8956	0.665	13.4522	2.3595	1.4753	0.4535	2.7709	0.2071
	Ranksum	1.122	-3.866	-3.159	2.661	-3.866	-1.746	-3.824	-4.656	1.746	-4.074	2.952	-1.995	1.039	2.952	-1.289

Panel B: W Indexes based on Sub-groups															
	Size			Industry			*Chaebol* Affiliation			Region			Listing		
	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds
81-12	0.572	0.629	0.610	0.519	0.555	0.435	0.596	0.672	0.606	0.524	0.575	0.444	0.616	0.684	0.658
81-96	0.444	0.544	0.551	0.428	0.503	0.380	0.472	0.624	0.514	0.402	0.471	0.363	0.504	0.619	0.573
93-96	0.400	0.514	0.633	0.490	0.559	0.402	0.419	0.604	0.428	0.427	0.536	0.406	0.419	0.534	0.534
1997	0.227	0.307	0.693	0.255	0.245	0.407	0.174	0.191	0.285	0.240	0.285	0.462	0.228	0.243	0.397
1998	0.821	0.807	0.516	0.691	0.648	0.493	0.918	0.717	0.497	0.703	0.679	0.434	0.929	0.770	0.658
99-04	0.806	0.796	0.620	0.645	0.635	0.476	0.826	0.799	0.759	0.710	0.728	0.471	0.751	0.808	0.702
99-12	0.725	0.736	0.677	0.630	0.630	0.497	0.745	0.759	0.742	0.670	0.707	0.535	0.749	0.784	0.772

Notes: The table shows the average credit flows in sales quintiles (Panel A) and the W indexes for five firm classifications (size, industry, chaebol affiliation, region and listing) (Panel B). In Panel A, the first (fifth) quintile is the quintile with the smallest (largest) firms. The Chow test statistics come from Chowtests for a structural break in 1998.

Table 4. Volatility and Unconditional Correlation

Panel A: Volatility

	Total Credit					Loans					Bonds				
	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC
	s.d.					s.d.					s.d.				
81-12	4.499	4.345	4.850	7.397	6.602	6.126	7.067	7.918	10.594	9.573	8.306	5.807	7.698	12.089	9.699
81-96	2.387	1.208	2.074	3.164	2.416	3.916	4.074	3.205	7.321	6.120	7.454	5.461	8.230	10.151	10.699
99-12	5.406	3.807	4.364	8.271	4.835	6.372	5.761	4.118	11.429	5.565	6.560	5.036	6.921	9.428	8.027
	s.d. of H.P filtered flow					s.d. of H.P filtered flow					s.d. of H.P filtered flow				
81-12	3.587	1.921	2.710	5.076	3.122	4.440	3.955	2.954	7.873	5.125	5.730	3.247	5.045	7.830	6.739
81-96	2.065	1.085	1.799	2.765	2.038	3.376	3.467	2.896	6.201	5.078	5.993	3.798	4.699	8.866	7.367
99-12	4.095	2.237	3.383	5.666	3.445	4.312	3.818	3.155	7.510	4.880	4.868	2.655	5.195	5.874	6.523
	s.d./mean*100					s.d./mean*100					s.d./mean*100				
81-12	31.733	59.964	22.639	106.733	49.957	32.333	55.722	25.035	169.149	43.514	37.640	49.557	22.787	116.818	46.100
81-96	17.385	29.058	11.594	33.053	29.058	23.758	49.781	12.995	88.239	39.541	29.642	57.475	23.753	64.882	56.575
99-12	39.266	109.079	25.284	80.475	69.266	37.284	78.445	16.853	117.279	37.888	33.237	96.399	27.729	64.958	76.830

Panel B: Unconditional correlation of credit flows with GDP growth rate

	1981-2012					1981-1996					1999-2012				
	t-2	t-1	t	t+1	t+2	t-2	t-1	t	t+1	t+2	t-2	t-1	t	t+1	t+2
	Panel B-1: Total credit														
POS	0.005	0.298	0.173	-0.695*	0.185	-0.010	0.044	0.219	-0.320	-0.168	-0.068	0.413	-0.079	-0.668*	0.362
NEG	0.248	-0.364*	-0.202	0.518*	-0.029	0.134	-0.250	-0.170	-0.205	0.597*	0.426	-0.449	0.102	0.460	-0.444
SUM	0.183	0.137	0.086	-0.552*	0.225	0.069	-0.100	0.149	-0.491	0.168	0.199	0.203	-0.028	-0.504	0.142
NET	-0.090	0.349	0.198	-0.687*	0.142	-0.060	0.131	0.230	-0.159	-0.359	-0.218	0.475	-0.097	-0.664*	0.437
EXC	0.037	-0.211	-0.208	0.536*	0.016	0.156	-0.230	-0.150	-0.206	0.548*	0.051	-0.217	0.115	0.549*	-0.363
	Panel B-2: Total credit (Excluding the year 2008)														
POS	-0.038	0.304	0.264	-0.718*	0.089	-0.010	0.044	0.219	-0.320	-0.168	-0.242	0.520	0.144	-0.527	-0.152
NEG	0.285	-0.357*	-0.241	0.489*	0.040	0.134	-0.250	-0.170	-0.205	0.597*	0.538	-0.447	0.005	0.301	-0.251
SUM	0.174	0.109	0.148	-0.535*	0.144	0.069	-0.100	0.149	-0.491	0.168	0.176	0.165	0.145	-0.284	-0.341
NET	-0.146	0.358*	0.282	-0.696*	0.044	-0.060	0.131	0.230	-0.159	-0.359	-0.450	0.589*	0.095	-0.516	0.032
EXC	0.068	-0.194	-0.260	0.507*	0.104	0.156	-0.230	-0.150	-0.206	0.548*	0.136	-0.182	-0.009	0.373	-0.057
	Panel B-3: Loans														
POS	-0.111	0.293	0.239	-0.663*	0.069	0.018	-0.014	0.064	-0.080	-0.312	-0.321	0.506	0.017	-0.725*	0.348
NEG	0.285	-0.365*	-0.257	0.598*	0.060	0.075	-0.394	-0.002	0.019	0.528*	0.586*	-0.412	-0.134	0.810*	-0.523
SUM	0.214	-0.048	0.014	-0.195	0.183	0.111	-0.488	0.072	-0.071	0.269	0.270	0.193	-0.138	-0.011	-0.157
NET	-0.206	0.348	0.264	-0.674*	0.009	-0.032	0.213	0.036	-0.054	-0.465	-0.482	0.500	0.078	-0.829*	0.466
EXC	-0.059	-0.182	-0.125	0.457*	0.122	0.124	-0.229	-0.060	-0.031	0.493	-0.150	-0.141	-0.050	0.654*	-0.220
	Panel B-4: Bonds														
POS	0.299	0.128	-0.557*	0.069	0.142	0.137	-0.120	-0.329	0.155	-0.093	0.438	0.302	-0.651*	0.077	0.235
NEG	0.141	-0.231	0.289	-0.039	0.053	0.110	-0.219	0.275	-0.331	0.320	0.293	-0.255	0.452	-0.151	-0.329
SUM	0.430*	-0.004	-0.446*	0.053	0.195	0.263	-0.329	-0.198	-0.070	0.140	0.560*	0.153	-0.379	-0.005	0.052
NET	0.161	0.189	-0.527*	0.067	0.082	0.045	0.013	-0.341	0.247	-0.200	0.231	0.366	-0.744*	0.132	0.343
EXC	0.189	-0.115	0.147	0.046	0.036	0.112	-0.226	0.277	-0.324	0.310	0.323	-0.021	0.184	0.150	-0.428

Notes: Panel A reports three volatility measures for credit flows: the standard deviation (1st to 3rd row), the standard deviation of the HP-filtered credit flows (4th to 6th row) and the coefficient of variation of the flows (standard deviation/mean) (7th to 9th rows). Panel B reports the unconditional correlation coefficients of the credit flows with the HP-filtered GDP growth rate. Panel B-1 refers to total credit, Panel B-2 to total credit excluding 2008, Panel B-3 to loans and Panel B-4 to bonds. Each panel displays correlations for the full sample (1981-2012) period and for the pre-crisis (1981-1996) period and for the post-crisis (1999-2012) period. * denotes statistical significance at the 5% level.

Table 5. Properties of Idiosyncratic Flows

		Size			Manufacturing			*Chaebol* Affiliation		
		Credit	Loans	Bonds	Credit	Loans	Bonds	Credit	Loans	Bonds
Panel A: Gross credit reallocation										
Sectoral effects	81-12	0.609	0.760	0.723	0.830	0.689	0.532	0.574	0.414	0.342
	81-96	1.055	3.996	0.627	2.039	1.321	0.333	2.955	2.155	0.196
	99-12	0.602	1.404	0.361	0.368	0.860	0.560	0.286	1.107	0.440
Idiosyncratic effects	81-12	0.599	0.722	2.200	0.316	0.161	0.577	1.006	0.753	1.582
	81-96	1.748	3.843	2.147	1.595	0.842	0.363	4.123	1.765	1.374
	99-12	0.912	1.978	1.404	0.480	0.404	0.200	1.516	1.858	1.520
Covariance term	81-12	-0.209	-0.482	-1.923	-0.146	0.150	-0.109	-0.580	-0.167	-0.925
	81-96	-1.802	-6.839	-1.774	-2.633	-1.163	0.304	-6.078	-2.920	-0.570
	99-12	-0.514	-2.382	-0.765	0.152	-0.264	0.239	-0.802	-1.965	-0.960
Panel B: Excess credit reallocation										
Sectoral effects	81-12	1.086	0.929	1.340	0.986	0.772	1.104	0.791	0.527	1.288
	81-96	3.723	2.219	1.198	1.551	1.002	0.849	1.771	0.932	1.075
	99-12	1.873	2.038	0.514	1.352	1.243	0.658	1.693	1.581	0.734
Idiosyncratic effects	81-12	0.402	0.427	0.871	0.064	0.090	0.302	0.329	0.388	0.975
	81-96	3.518	1.000	0.749	0.524	0.148	0.222	1.735	0.176	0.852
	99-12	0.604	0.477	0.892	0.090	0.176	0.189	0.533	0.456	1.149
Covariance term	81-12	-0.489	-0.356	-1.211	-0.050	0.138	-0.406	-0.121	0.084	-1.263
	81-96	-6.241	-2.219	-0.947	-1.074	-0.150	-0.072	-2.506	-0.108	-0.927
	99-12	-1.476	-1.515	-0.406	-0.442	-0.419	0.153	-1.226	-1.037	-0.883

Notes: Panel A of this table shows the variance decomposition of the gross reallocation of total credit, loans and bonds. Panel B shows the variance decomposition of the excess reallocation of total credit, loans and bonds.

Table 6. Decomposition of Correlation

	1981-2012					1981-1996					1999-2012				
	t-2	t-1	t	t+1	t+2	t-2	t-1	t	t+1	t+2	t-2	t-1	t	t+1	t+2
Panel A: Total credit															
SUM	0.103	0.071	0.040	-0.324	0.128	0.122	0.058	0.297	-0.375	-0.241	0.125	0.158	0.064	-0.391	0.092
SD ratio 1	1.361	1.361	1.361	1.361	1.349	1.165	1.165	1.165	1.165	1.165	1.108	1.108	1.108	1.108	1.177
EXC	0.005	-0.120	-0.091	0.281	0.031	0.203	-0.193	-0.112	-0.231	0.327	0.015	-0.100	0.192	0.400	-0.295
SD ratio 2	1.216	1.216	1.216	1.216	1.188	1.526	1.526	1.526	1.526	1.526	1.484	1.484	1.484	1.484	1.538
|NET|	0.079	0.193	0.135	-0.581	0.072	-0.075	0.185	0.280	-0.069	-0.408	0.073	0.181	-0.100	-0.562	0.285
Panel B: Loans															
SUM	0.079	-0.024	0.004	-0.072	0.077	0.170	-0.311	0.223	0.015	-0.083	0.204	0.219	-0.108	-0.052	-0.138
SD ratio 1	1.209	1.209	1.209	1.209	1.181	1.909	1.909	1.909	1.909	1.909	1.352	1.352	1.352	1.352	1.418
EXC	-0.033	-0.103	-0.050	0.276	0.087	0.150	-0.200	-0.054	-0.049	0.433	-0.071	0.027	-0.165	0.494	-0.180
SD ratio 2	0.954	0.954	0.954	0.954	0.931	1.896	1.896	1.896	1.896	1.896	1.912	1.912	1.912	1.912	1.941
|NET|	0.125	0.106	0.067	-0.425	-0.027	-0.062	0.037	0.171	0.057	-0.480	0.157	0.096	0.060	-0.377	0.060
Panel C: Bonds															
SUM	0.289	-0.023	-0.315	0.024	0.141	0.205	-0.219	-0.209	-0.197	0.124	0.368	0.074	-0.134	0.041	0.008
SD ratio 1	1.260	1.260	1.260	1.260	1.292	1.300	1.300	1.300	1.300	1.300	1.160	1.160	1.160	1.160	1.193
EXC	0.126	-0.098	0.122	0.054	0.038	0.121	-0.218	0.130	-0.328	0.297	0.254	0.049	0.195	0.099	-0.389
SD ratio 2	1.226	1.226	1.226	1.226	1.249	1.215	1.215	1.215	1.215	1.215	0.827	0.827	0.827	0.827	0.872
|NET|	0.106	0.082	-0.383	-0.036	0.073	0.039	0.053	-0.311	0.189	-0.216	0.089	0.021	-0.435	-0.089	0.541

Notes: This table reports the decomposition of the correlation between credit reallocation and the HP-filtered GDP growth rate (see formula (9) in the main text). SD ratio 1 is the ratio between the standard deviation of EXC and the standard deviation of SUM. SD ratio 2 is the ratio between the standard deviation of the absolute value of NET and the standard deviation of SUM.

Table 7. Conditional Correlation of Credit Reallocation

		1987-2012			1987-1996			1999-2012		
		Credit	Loans	Bonds	Credit	Loans	Bonds	Credit	Loans	Bonds
Cyclicality	1st quintile	0.0570***	0.0467***	-0.00240***	0.263***	0.152***	0.0109***	0.0225*	0.0398***	-0.000832
		(0.00657)	(0.00550)	(0.000726)	(0.0204)	(0.0174)	(0.00408)	(0.0122)	(0.0104)	(0.00105)
	2nd quintile	0.0359***	0.0354***	-0.00211***	0.194***	0.113***	0.00173	0.00772	0.0326***	-0.00174*
		(0.00531)	(0.00452)	(0.000734)	(0.0185)	(0.0152)	(0.00408)	(0.00900)	(0.00804)	(0.00103)
	3rd quintile	0.0340***	0.0262***	-0.00129	0.132***	0.0727***	0.00536	0.0249***	0.0359***	-0.00678***
		(0.00507)	(0.00431)	(0.000818)	(0.0175)	(0.0145)	(0.00406)	(0.00849)	(0.00747)	(0.00119)
	4th quintile	0.0394***	0.0229***	0.00278***	0.0762***	0.0384***	0.00123	0.0474***	0.0515***	-0.00856***
		(0.00521)	(0.00444)	(0.00103)	(0.0176)	(0.0143)	(0.00468)	(0.00851)	(0.00734)	(0.00148)
	5th quintile	0.0301***	0.0338***	-0.00160	0.0427**	0.0204	-0.00322	0.0569***	0.0699***	-0.00849***
		(0.00515)	(0.00443)	(0.00145)	(0.0175)	(0.0154)	(0.00452)	(0.00775)	(0.00669)	(0.00186)
Profitability	1st quintile	0.0005***	0.0002***	0.0000	0.0006***	0.0002***	0.0000	0.0005***	0.0002***	0.0000
		0.0000	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	2nd quintile	0.0004***	0.0001***	-0.0000	0.0006***	0.0002***	0.0000	0.0003***	0.0000***	-0.0000**
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	3rd quintile	0.0005***	0.0002***	0.0000**	0.0006***	0.0002**	0.0000	0.0004***	0.0001***	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	4th quintile	0.0005***	0.0002***	0.0000***	0.0006***	0.0002**	0.0000	0.0005***	0.0002***	0.0000***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	5th quintile	0.0006***	0.0003***	0.0000***	0.0008***	0.0004***	0.0000***	0.0006***	0.0002***	0.0000***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Cyclicality	Non-chaebol	0.037***	0.031***	-0.0003	0.116***	0.063***	0.004	0.037***	0.048***	-0.005***
		(0.003)	(0.002)	(0.0004)	(0.013)	(0.011)	(0.003)	(0.005)	(0.004)	(0.0007)
	Chaebols	0.046***	0.049***	-0.011***	0.115***	0.065***	0.002	0.026	0.074***	-0.014***
		(0.011)	(0.008)	(0.003)	(0.026)	(0.022)	(0.006)	(0.020)	(0.015)	(0.005)
Profitability	Non-Chaebol	0.0006***	0.0002***	0.00005***	0.0007***	0.0003***	0.0000**	0.0006***	0.0002***	0.0000***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Chaebols	0.001***	0.0004***	0.0001***	0.0009***	0.0004***	0.0000	0.0008***	0.0003***	0.0001***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: This table shows the coefficient estimates of firm level credit changes on the HP-filtered GDP (cyclicality) and on Tobin's q (profitability) for the five sales quintiles and for *cheabol* and non-*chaebol* firms. The numbers in parentheses denote standard errors. *, ** and *** indicate 10%, 5 % and 1% statistical significance. The 1st quintile and the 5th quintile are the quintiles of the smallest and the largest firms, respectively.

Table 8. Efficiency of Credit Reallocation

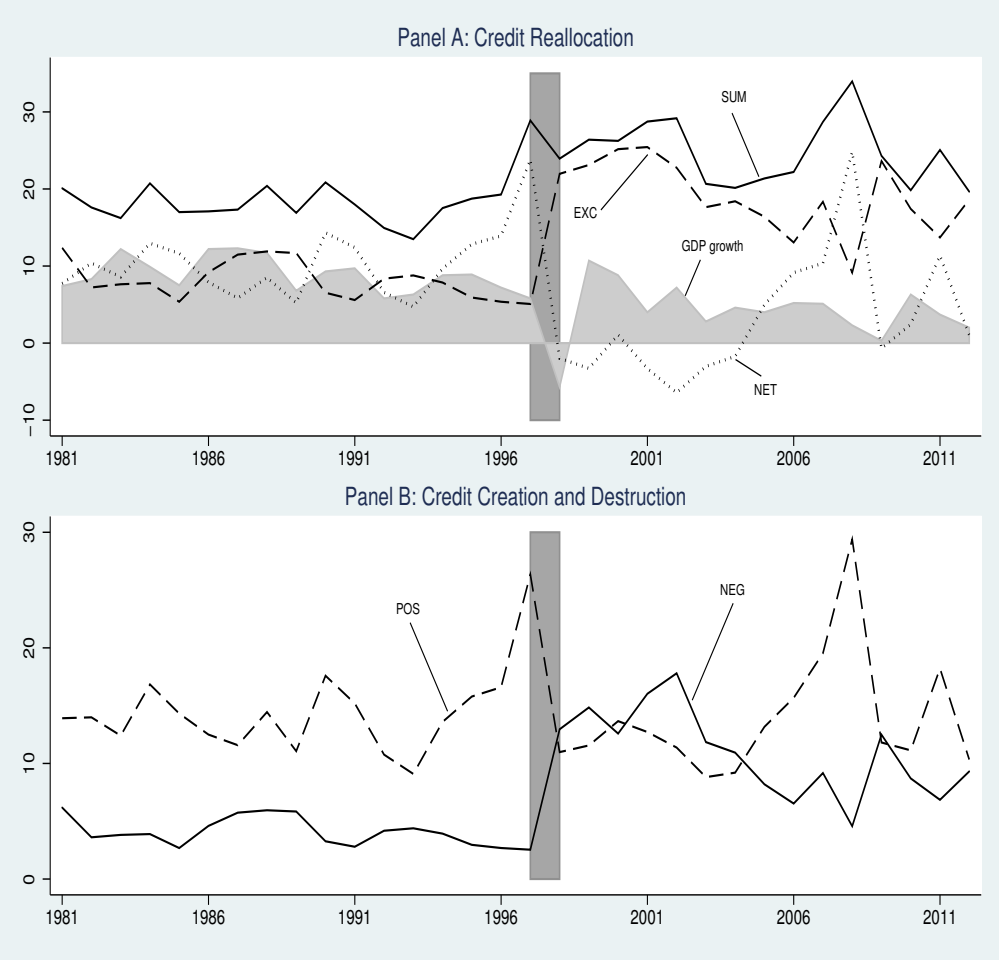
		All	*Chaebol* Affiliation		Size Quintile				
			Chaebols	Non-*Chaebols*	1st	2nd	3rd	4th	5th
Panel A: Total credit									
					Operating profits				
Average	87-96	1.022	0.942	0.983	0.490	0.420	0.462	0.385	0.481
	99-12	1.040	1.009	0.977	0.932	0.783	0.983	0.934	0.478
					Sales				
Average	85-96	0.987	0.948	0.957	1.202	1.589	1.364	1.010	0.770
	99-12	1.071	1.027	1.004	1.295	1.152	1.314	1.300	0.585
Panel B: Loans									
					Operating profits				
Average	87-96	1.038	0.958	1.004	0.513	0.432	0.444	0.436	0.518
	99-12	1.029	1.160	0.948	0.824	0.770	0.978	0.855	0.665
					Sales				
Average	85-96	1.012	0.965	0.980	1.127	1.688	1.399	1.012	0.798
	99-12	1.078	1.055	0.982	1.402	1.141	1.352	1.218	0.626

Notes: This table displays the values of the efficiency index of credit reallocation constructed using the profits to capital ratios and the sales to capital ratios of the firms. Panel A refers to total credit, Panel B to loans. Each panel reports the values of the index for all firms, for *chaebol* and non-*chaebol* firms, and for firms of different size. It also reports values of the index for the pre-crisis (1981-1996) and the post-crisis (1999-2012) period.

Figure 1. GDP and Business Sector Debt and Equity

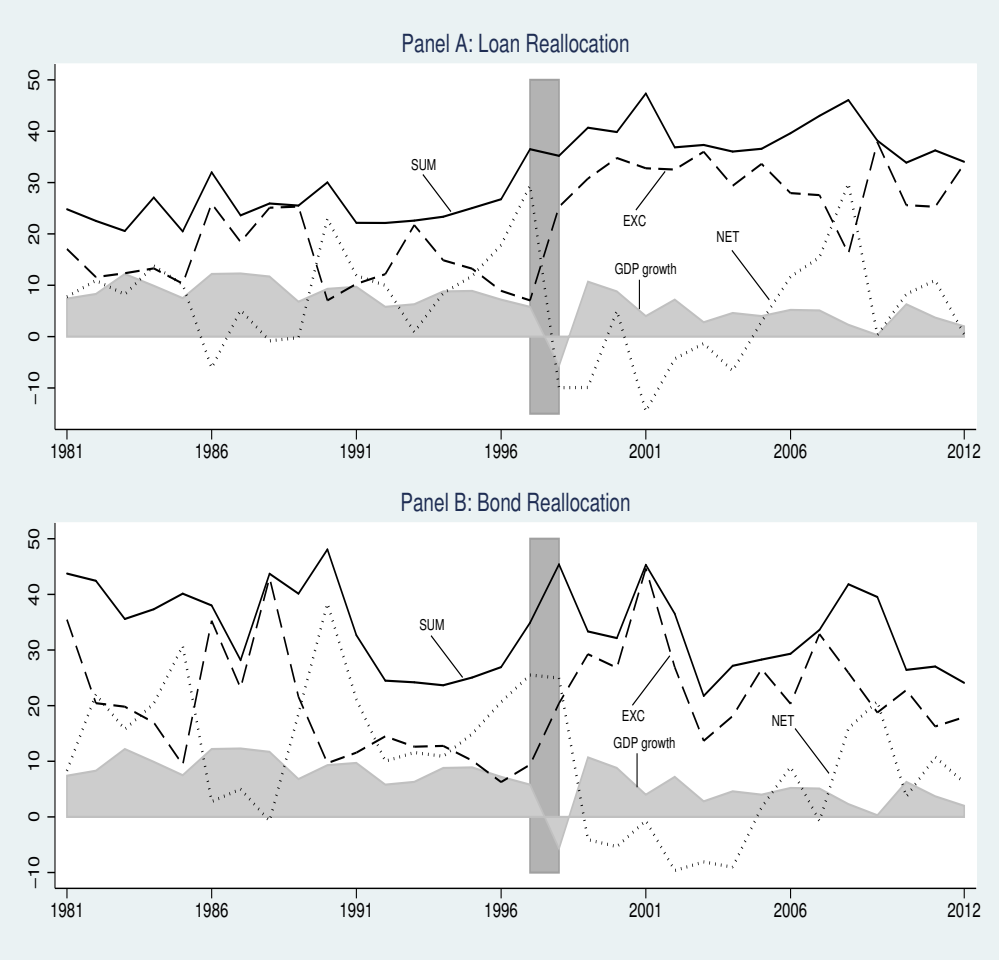
Notes: Panel A shows the real GDP growth rate of South Korea and the real growth rate of the total debt and equity of Korean firms. The solid line is the year-on-year quarterly growth rate of the real GDP (scale on the right Y-axis). The dashed line and the dotted line represent the year-on-year quarterly real growth rate of the total outstanding debt and total outstanding equity of Korean firms, respectively (scale on the left Y-axis). Debt consists of total loans from financial institutions and bonds issued. Debt and equity data are from the Flow of Funds Accounts compiled by the Bank of Korea. Panel B shows the aggregate leverage ratio (total debt/nominal GDP, solid spike) of Korean firms for the period 1990:1 to 2005:1. The shaded areas in the Panel A and B correspond to the financial crisis.

Figure 2. Credit Change and Credit Reallocation



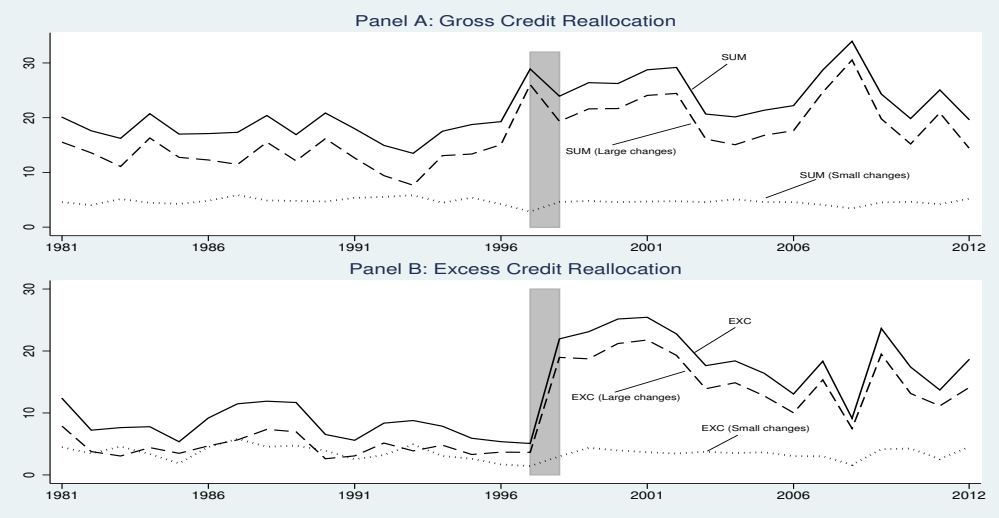
Notes: Panel A shows gross credit reallocation (SUM, solid line), excess credit reallocation (EXC, dashed line), the net credit change (NET, dotted line), and the annual real GDP growth rate (gray area). Panel B shows credit creation (POS, dashed line) and credit destruction (NEG, solid line). The vertical shaded areas in the two panels correspond to the financial crisis.

Figure 3. Loan and Bond Reallocation



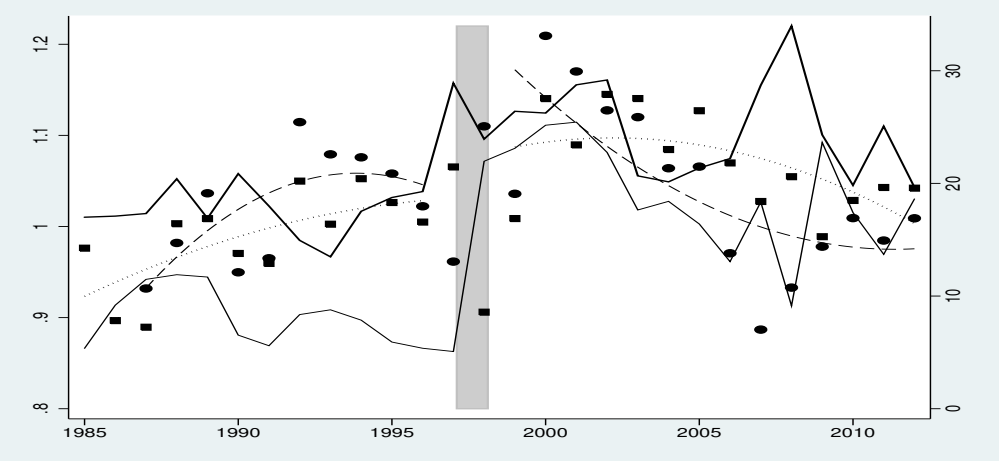
Notes: Panel A shows loan reallocation (SUM, solid line), excess credit reallocation (EXC, dashed line), the net credit change (NET, dotted line), and the annual real GDP growth rate (gray area). Panel B shows bond reallocation (SUM, solid line), excess credit reallocation (EXC, dashed line), the net credit change (NET, dotted line), and the annual real GDP growth rate (gray area). The vertical shaded areas in the two panels correspond to the financial crisis.

Figure 4. Large Credit Flows



Notes: Panel A of this figure shows gross credit reallocation (SUM, solid line), gross credit reallocation due to large changes (dashed line) and to small changes (dotted line) for the period 1981 to 2012. Panel B of this figure shows excess credit reallocation (EXC, solid line), excess credit reallocation due to large changes (dashed line) and to small changes (dotted line) for the period 1981 to 2012. The vertical shaded areas in the two panels correspond to the financial crisis.

Figure 5. Efficiency of Credit Reallocation



Notes: This figure shows the annual values of two efficiency indexes of credit reallocation computed using firms' sales to capital ratios (squares) and profit to capital ratios (bullet points). The figure shows four quadratic fitted lines for each index in the pre-crisis period and the post-crisis period (dotted lines for sales, dashed lines for profits and dash-dotted lines for SFA efficiency). The efficiency index using operating profits starts in 1987 due to data availability. The right Y-axis provides the scale for the magnitude of gross credit reallocation (solid bold line) and excess credit reallocation (solid light line).

Supplement (for online publication)

Section S1: Robustness analysis with quarterly data

This supplementary section provides a robustness analysis of the time series properties of credit flows, using quarterly data over the period 2000:1 to 2012:4. Due to data availability, the sample covers only publicly traded firms. For each quarter, we construct credit flows (credit creation, destruction, reallocation and excess reallocation) using firms' credit changes relative to the same quarter of the previous year. Panel A of Table S1 reports the averages and the standard deviations of the credit flows constructed using quarterly data. Panel B reports unconditional correlation coefficients between the credit flows and the GDP growth rate (computed relative to the same quarter of the previous year). The correlation coefficients are very close to those obtained using annual data. Panel C of Table S1 shows the decomposition of correlation. Again, the results confirm those obtained using annual data. In further tests, we also investigated the cyclical behavior of credit creation and destruction using the approach proposed by Den Haan (2000) to examine conditional correlation. In particular, we estimated VARs with the quarterly data and computed the correlations of VAR forecast errors at different horizons. The results (available upon request) confirm the cyclical pattern implied by unconditional correlation coefficients.

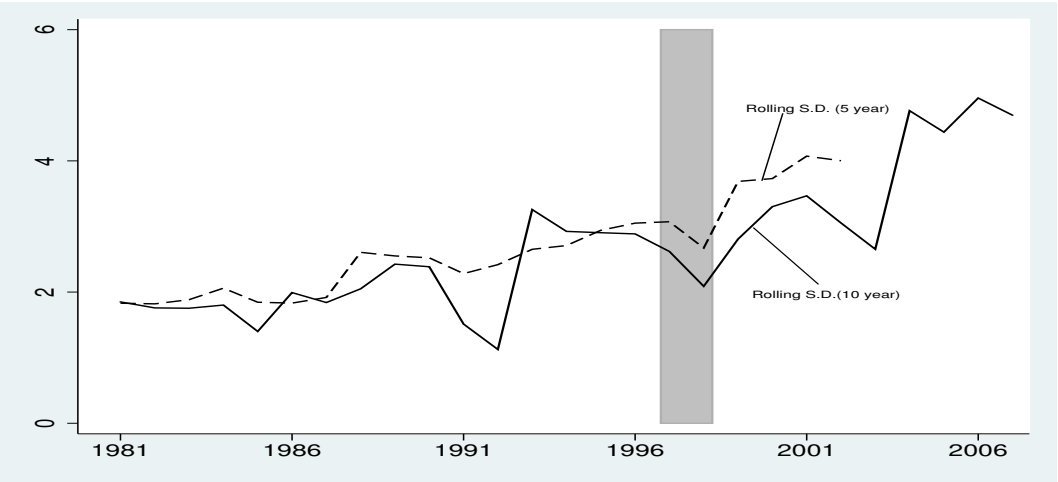
Supplementary Table S1. Properties of credit flows (quarterly data)

	Panel A: Average and volatility						Panel B: Unconditional correlation						Panel C: Decomposition of Correlation				
	POS	NEG	SUM	NET	EXC		t-2	t-1	t	t+1	t+2		t-2	t-1	t	t+1	t+2
Average	11.137	8.254	19.391	2.883	11.942	POS	0.094	-0.264	-0.572*	-0.702*	-0.549*	SUM	0.032	-0.120	-0.257	-0.370*	-0.3200*
S.D.	6.385	4.109	5.238	9.374	3.641	NEG	-0.081	0.307*	0.549*	0.550*	0.360*	SD ratio 1	0.701	0.701	0.695	0.700	0.705
S.D. (HP-filtered)	4.609	2.470	4.269	6.039	3.459	SUM	0.062	-0.132	-0.300*	-0.442*	-0.385*	EXC	0.025	0.236	0.457*	0.518*	0.351*
Coefficient of variation	0.573	0.498	0.270	3.251	0.305	NET	0.104	-0.320*	-0.661*	-0.759*	-0.564*	SD ratio 2	1.199	1.201	1.203	1.215	1.219
						EXC	0.031	0.246	0.473*	0.531*	0.350*	NET	0.012	-0.238	-0.478*	-0.603*	-0.465*

Notes: * denotes statistical significance at the 5% level.

Section S2: Rolling standard deviation

Supplementary Figure S1. Rolling s.d.



Notes: This figure shows the rolling standard deviations of the gross credit reallocation using a 5 year window (dashed line) and a 10 year window (solid line). The X-axis denotes the year in which the rolling windows start.

References

Den Haan, J. W., 2000. The comovement between output and prices. *Journal of Monetary Economics*, 46, pp. 3-30.