

# Credit Reallocation, Deleveraging and Financial Crises

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- With heterogeneous firms and imperfect credit markets, credit allocation as important as total volume of credit.
- But, while we know lot about dynamics of financial aggregates, we know very little about continuous *reallocation* of financial resources
- Boom-bust process: leveraging and deleveraging  
(Bordo and Haubrich, 2010; Mendoza and Terrones, 2012; Admati et al, 2012)

- Can we learn from dynamics of reallocation of credit, besides credit growth?
- Should we respond to creditless recoveries by stimulating credit creation or discouraging credit destruction?
- Do crises and subsequent reforms impact credit reallocation process, besides aggregate credit growth?

- Dynamic process of credit reallocation, before and after financial crises and reforms. South Korea 1997 financial crisis and reforms natural laboratory
- Credit boom leading to financial crisis characterized by low intensity of credit reallocation
- After crisis and reforms, slowdown in credit growth (deleveraging) and increase in credit reallocation (higher credit market "fluidity"). Driven by loan reallocation, rather than bond financing reallocation
- Increase in volatility in credit reallocation

- During credit boom, procyclical credit reallocation driven by credit growth. After crisis and reforms, driven by excess credit reallocation
- Increase in credit reallocation accompanied by increased efficiency in allocation of credit
- Structural changes in credit reallocation process after the 1997 financial crisis and reforms

- Labor (job) and capital reallocation

Davis & Haltiwanger (QJE, 1992; AER, 1999); Davis *et al*, (JEP, 2006); Liu (JME, 2013); Eifeldt & Rampini (JME, 2006); Hidakata & Sunakawa (BOJ, 2013); Midrigan and Xu (AER, 2013)

- Interfirm credit reallocation

Herrera, Kolar and Minetti (JME, 2011); Liborio & Sanchez (FRB St.Louis, 2012)

- Macro-financial linkages

Kiyotaki & Moore (JPE, 1997); Bernanke *et al* (NBER, 1999); Unsal (IMF, 2011); Gerke (Bundesbank, 2012); Borio (BIS, 2012); Kim *et al* (BOK, 2012)

# Sample, Measurement Issues and Aggregation

- Data source: KISLINE (the leading credit rating agency)
- Size: 30,848 non-financial firms subject to outside auditing (332,296 observations)
- 49.23% regular employment in 2000
- 56.72% bank loans in 2008
- Period: 1981 to 2012 (crisis period: 1997 to 1998)
- Measurement issues

- Definition of credit

includes all forms of financial debt, not trade credit (Kolar et al, 2011).

- Mismatch of fiscal and calendar year

following the way that COMPUSTAT uses, if fiscal year ends before May 31st, the data for a whole fiscal year are attributed to the previous calendar year.

- Inflation

deflates the original data using the GDP deflator.

- Well-established methodology developed by Davis and Haltiwanger (QJE 1992, NBER 1996)



# Sample, Measurement Issues and Aggregation

- $c_{ft}$  is defined as the average of outstanding debt of firm  $f$  between the year  $t-1$  and the year  $t$ .
- $C_{st}$  is the average of outstanding debt of a sub-group  $s$  of firms between the year  $t-1$  and the year  $t$ .
- Debt growth rate of firm  $f$  ( $g_{ft}$ ) is a change in debt from the year  $t-1$  to the year  $t$  divided by the debt average ( $c_{ft}$ )
- Symmetric about zero, bounded in the interval  $[-2,+2]$
- For newborn firms  $g_{ft} = 2$ ;
- For dying firms  $g_{ft} = -2$

# Sample, Measurement Issues and Aggregation

Aggregation: 5 credit flows

Credit creation ( $POS_{st}$ ): weighted sum of debt growth rates of firms with increasing debt or newborn firms

$$POS_{st} = \sum_{\substack{f \in S_t \\ g_{ft} > 0}} g_{ft} \left( \frac{c_{ft}}{C_{st}} \right)$$

Credit destruction ( $NEG_{st}$ ): weighted sum of absolute values of debt growth rates of firms with decreasing debt or dying firms

$$NEG_{st} = \sum_{\substack{f \in S_t \\ g_{ft} < 0}} |g_{ft}| \left( \frac{c_{ft}}{C_{st}} \right)$$

Credit reallocation ( $SUM_{st}$ )

$$SUM_{st} = POS_{st} + NEG_{st}$$

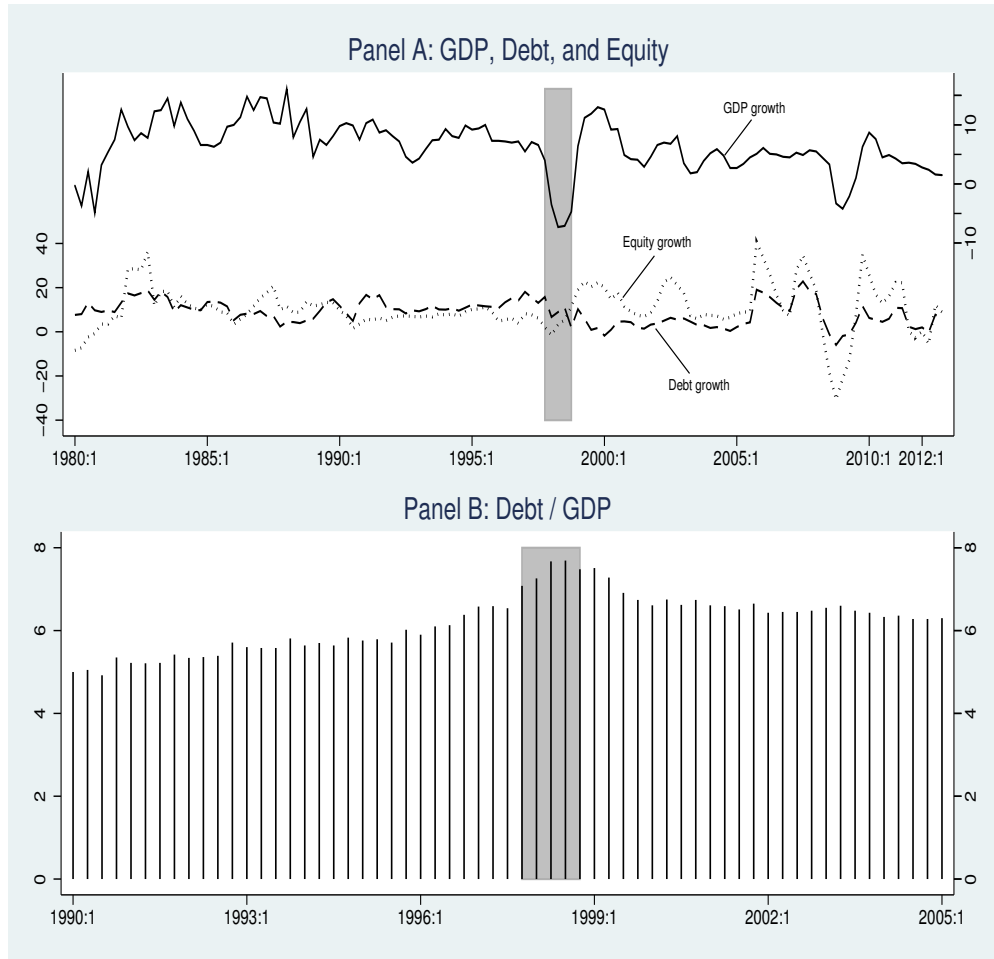
Net credit change ( $NET_{st}$ )

$$NET_{st} = POS_{st} - NEG_{st}$$

Excess credit reallocation ( $EXC_{st}$ ): measures credit reallocation in excess of the minimum required to accommodate net credit changes.

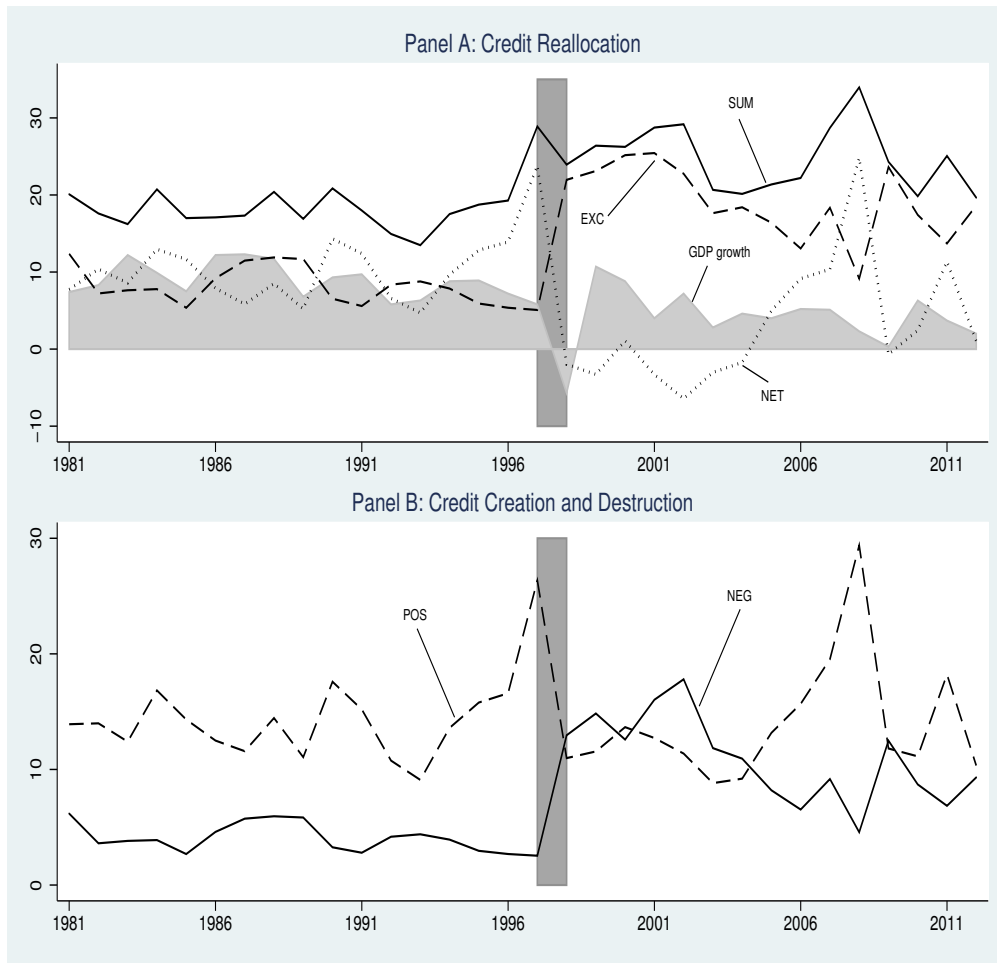
$$EXC_{st} = SUM_{st} - |NET_{st}|$$

**Figure 1. GDP and Business Sector Debt and Equity**



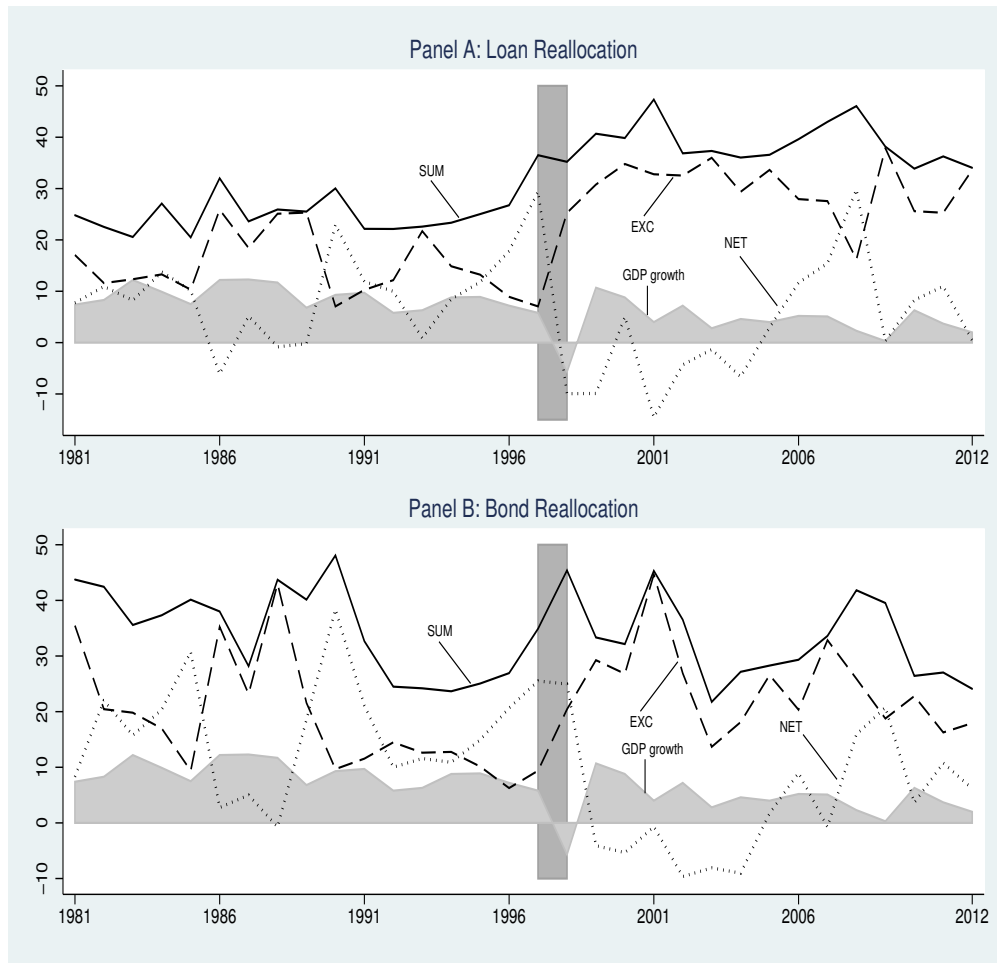
**Notes:** Panel A shows the real GDP growth rate of South Korea and the real growth rate of the total debt and equity of Korean firms. The solid line is the year-on-year quarterly growth rate of the real GDP (scale on the right Y-axis). The dashed line and the dotted line represent the year-on-year 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.

TABLE 1  
Magnitude of Gross Credit Flows

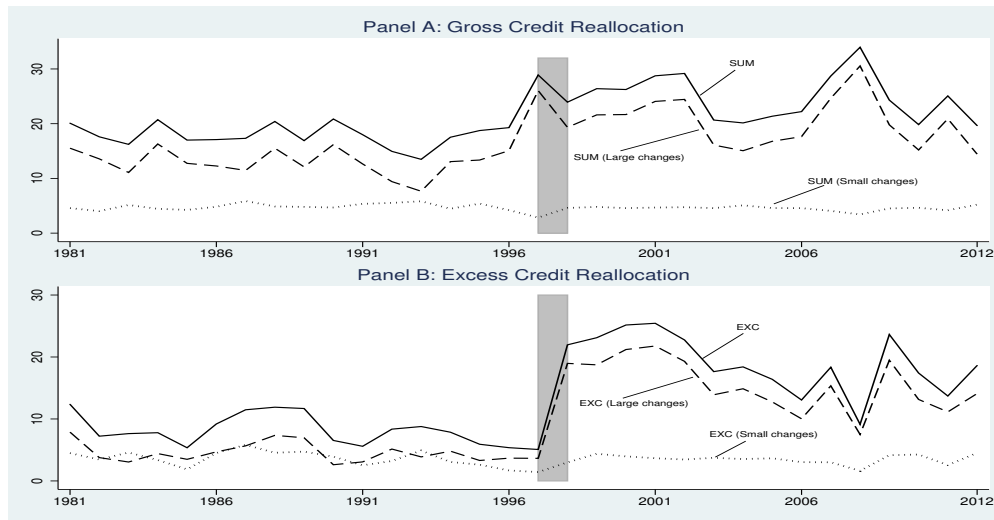
Panel A: Credit flows															
Period	Total credit					Loans					Bonds				
	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC
81-12	14.2	7.2	21.4	6.9	13.2	18.9	12.7	31.6	6.3	22.0	22.1	11.7	33.8	10.3	21.0
81-96	13.7	4.2	17.9	9.6	8.3	16.5	8.2	24.7	8.3	15.5	25.1	9.5	34.6	15.6	18.9
93-96	13.8	3.5	17.3	10.3	7.0	17.1	7.3	24.4	9.7	14.7	19.7	5.2	25.0	14.5	10.4
99-04	11.2	14.0	25.2	-2.8	22.1	17.2	22.5	39.7	-5.3	32.7	13.4	19.4	32.7	-6.1	26.6
99-12	14.0	10.7	24.8	3.3	18.8	21.2	17.8	39.0	3.4	30.3	17.0	14.9	31.9	2.2	24.3
Chow test	0.2	2.3	1.9	2.6	4.0	1.5	3.6	3.9	1.1	8.3	3.2	2.3	0.6	4.0	1.2
Rank sum	0.7	-4.4	-4.1	2.8	-4.4	-2.5	-3.9	-4.7	1.5	-4.3	3.0	-2.7	0.8	3.1	-1.9

Panel B: Credit flows due to large credit changes															
Period	Total credit					Loans					Bonds				
	POS big	NEG big	SUM big	NET big	EXC big	POS big	NEG big	SUM big	NET big	EXC big	POS big	NEG big	SUM big	NET big	EXC big
81-12	11.5	5.3	16.8	6.3	9.7	17.0	10.8	27.8	6.2	18.5	19.9	10.1	30.0	9.8	17.7
81-96	10.7	2.3	13.0	8.4	4.6	14.1	6.1	20.2	8.1	11.4	23.1	7.9	30.9	15.2	15.6
99-12	11.7	8.5	20.2	3.1	15.2	19.6	16.1	35.7	3.5	27.4	14.7	13.2	28.0	1.5	20.8

Notes: This table reports the average flows of total credit, loans, and bonds (Panel A) and the average flows of total credit, loans, and bonds due to large credit changes (Panel B). The period 1981 to 1996 and the period 1999 to 2012 reflect the pre-crisis period and the post-crisis one, respectively.

## Supplementary Figure A1. 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.



# Flight to Quality?

- We investigate the patterns of credit flows across sub-groups.
- Categories: size, industry, location, chaebol-affiliation, listings, sales (profit) volatility
- The within-group reallocation (or between-group reallocation)
- Within reallocation: driven by intra-group heterogeneity
- Between reallocation: driven by sectoral shocks or different impact of aggregate shocks on sectors
- The magnitude of the within-group reallocation (Davis and Haltiwanger, 1992)

$$W_t = 100 - \frac{\sum_{j=1}^J |\text{NET}_{jt}|}{\sum_{j=1}^J \text{SUM}_{jt}} 100$$

- The magnitude of the within-group reallocation (Davis and Haltiwanger, 1992)

$$W_t = 100 - \frac{\sum_{j=1}^J |\text{NET}_{jt}|}{\sum_{j=1}^J \text{SUM}_{jt}} 100 \quad (1)$$

where  $j$  denotes a sub-group.

$W=100$ : only within-group reallocation (no between-group reallocation)

$W=0$ : only between-group reallocation (no within-group reallocation)

$W$ : Within-group Reallocation Within- and between reallocation

Period	Industry	Region	Size	<i>Chaebol</i> -affiliation
Whole period	51.01	50.95	55.97	58.38
Pre-crisis	42.67	40.13	45.99	46.91
Post-crisis	61.97	65.40	68.49	73.03
1997	25.27	23.58	30.54	17.23
1998	67.88	63.56	79.45	92.55

- $W$  increased in the post-crisis period.

# Flight to Quality?

- W increased in the post-crisis period.

W dropped in 1997 (25.27) in which the financial crisis began. Then, it sharply increased in 1998 (67.88) above the average level.

The same pattern repeated in 2008 (33.31) and 2009 (71.61).

Credit reshuffling across sub-groups actively occurs shortly after the onset of a financial crisis. Then it weakens.

TABLE 2  
Credit Reallocation in Sub-groups

Panel A: Credit reallocation in size (sales) quintiles																
	Period	Total credit					Loans					Bonds				
		POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC
1st size quintile	81-12	20.0	7.9	27.9	12.1	15.8	23.3	10.8	34.1	12.4	20.4	41.7	29.2	70.9	12.6	40.9
	81-96	18.5	5.1	23.6	13.3	10.3	21.7	8.8	30.5	12.9	15.0	39.0	17.2	56.2	21.8	30.6
	99-12	22.1	11.3	33.4	10.7	22.6	25.5	13.4	38.9	12.1	26.8	47.7	40.1	87.9	7.6	52.4
	Chow	0.2	7.6	2.0	0.4	7.6	0.3	1.2	0.7	2.2	3.7	0.4	3.5	3.3	0.3	1.7
2nd size quintile	81-12	17.4	7.5	25.0	9.9	14.8	21.5	11.2	32.7	10.3	20.6	36.1	22.7	58.8	13.4	36.1
	81-96	16.6	5.0	21.7	11.6	9.9	20.0	9.5	29.5	10.5	16.0	34.1	14.5	48.5	19.6	26.3
	99-12	18.4	10.3	28.7	8.1	20.3	23.1	13.3	36.3	9.8	26.0	41.3	30.5	71.8	10.8	48.0
	Chow	0.8	4.8	2.1	1.8	3.9	0.2	1.6	1.5	0.6	4.3	0.5	2.2	2.9	0.3	5.9
3rd size quintile	81-12	15.1	7.3	22.4	7.9	13.9	20.9	12.0	33.0	8.9	21.9	24.6	17.3	42.0	7.3	26.2
	81-96	15.3	4.7	20.0	10.6	9.4	18.8	9.6	28.4	9.2	16.3	30.8	10.8	41.6	19.9	20.8
	99-12	14.5	10.1	24.6	4.5	19.1	22.7	14.9	37.5	7.8	28.3	18.9	24.9	43.8	-6.0	33.4
	Chow	0.4	3.5	1.3	2.3	2.8	0.7	1.3	1.9	0.6	2.3	0.6	5.2	0.6	2.6	3.5
4th size quintile	81-12	16.4	6.7	23.1	9.7	13.2	20.5	11.1	31.6	9.4	20.9	27.7	16.4	44.1	11.3	27.9
	81-96	16.8	4.2	21.0	12.5	8.5	19.5	8.6	28.1	11.0	15.2	25.5	9.4	35.0	16.1	18.7
	99-12	15.7	9.5	25.2	6.2	18.6	21.5	14.2	35.8	7.3	27.8	30.3	24.3	54.6	6.0	37.5
	Chow	0.4	4.9	2.3	2.2	5.3	0.3	2.1	3.1	0.3	3.7	0.3	3.5	1.1	1.1	1.7
5th size quintile	81-12	13.0	6.2	19.2	6.8	10.7	17.8	12.3	30.1	5.5	19.5	21.4	10.7	32.1	10.7	19.2
	81-96	12.6	3.5	16.1	9.2	6.9	15.4	7.5	22.9	7.9	13.8	24.3	9.1	33.4	15.2	18.2
	99-12	12.6	9.2	21.9	3.4	15.0	19.9	17.6	37.5	2.2	26.9	16.2	13.3	29.5	2.9	21.6
	Chow	0.1	1.7	1.4	2.0	3.3	1.1	3.4	3.8	1.1	10.3	3.6	1.6	1.2	3.9	0.9

Panel B: W indexes based on firm sub-groups or credit categories																
Period	Total	Firms' demographics						Firms' governance								
		Size			Industry			Region			Chaebol affiliation			Listing		
		Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	
81-12	0.57	0.63	0.61	0.52	0.56	0.44	0.52	0.58	0.44	0.60	0.67	0.61	0.62	0.68	0.66	
81-96	0.44	0.54	0.55	0.43	0.50	0.38	0.40	0.47	0.36	0.47	0.62	0.51	0.50	0.62	0.57	
1997	0.23	0.31	0.69	0.26	0.25	0.41	0.24	0.29	0.46	0.17	0.19	0.29	0.23	0.24	0.40	
99-12	0.73	0.74	0.68	0.63	0.63	0.50	0.67	0.71	0.54	0.75	0.76	0.74	0.75	0.78	0.77	

Period	Firms' Profitability and Efficiency						Credit Category						
	Return on assets			Return on equity			Profits to capital			Sales to capital			(Loans, Bonds)
	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	
81-12	0.54	0.62	0.59	0.55	0.63	0.56	0.56	0.65	0.58	0.59	0.67	0.55	0.65
81-96	0.47	0.61	0.56	0.49	0.61	0.54	0.45	0.60	0.49	0.41	0.59	0.46	0.58
1997	0.25	0.31	0.39	0.28	0.31	0.48	0.19	0.24	0.36	0.19	0.23	0.36	0.78
99-12	0.63	0.65	0.64	0.64	0.69	0.59	0.71	0.75	0.71	0.74	0.75	0.64	0.23

Notes: Panel A of the table shows the average credit flows in sales quintiles; Panel B shows the W indexes for firm classifications (size, industry, region, chaebol affiliation, listing, return on assets, return on equity, profits to capital ratio, and sales to capital ratio) and for credit category (loans and bonds). In Panel A, the first (fifth) quintile is the quintile with the smallest (largest) firms. The Chow test statistics come from Chow tests for a structural break in 1998.

# Time Series Properties

- Highly volatile credit reallocation. Credit destruction more volatile than creation
- Unconditional correlations
- Procyclical credit reallocation.
- Driven by procyclical net credit change before crisis, by procyclical excess credit reallocation after crisis

Table 3  
Volatility of Credit Reallocation

Panel A: Volatility															
	Total credit					Loans					Bonds				
	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EXC	POS	NEG	SUM	NET	EX
81-12	4.50	4.35	4.85	7.40	6.60	6.13	7.07	7.92	10.59	9.57	8.31	5.81	7.70	12.09	9.70
81-96	2.39	1.21	2.07	3.16	2.42	3.92	4.07	3.21	7.32	6.12	7.45	5.46	8.23	10.15	10.70
99-12	5.41	3.81	4.36	8.27	4.84	6.37	5.76	4.12	11.43	5.57	6.56	5.04	6.92	9.43	8.03
	s.d./mean*100					s.d./mean*100					s.d./mean*100				
81-12	31.73	59.96	22.64	106.73	49.96	32.33	55.72	25.04	169.15	43.51	37.64	49.56	22.79	116.82	46.10
81-96	17.39	29.06	11.59	33.05	29.06	23.76	49.78	13.00	88.24	39.54	29.64	57.48	23.75	64.88	56.58
99-12	39.27	109.08	25.28	80.48	69.27	37.28	78.45	16.85	117.28	37.89	33.24	96.40	27.73	64.96	76.83

Panel B: Variance decomposition													
		Size			Manufacturing			Chaebol affiliation			Profits to capital		
		Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds	Total	Loans	Bonds
Gross credit reallocation													
Sectoral effects	81-12	1.53	0.76	0.72	0.83	0.69	0.53	0.57	0.41	0.34	1.19	0.70	0.68
	81-96	8.92	3.98	0.63	2.04	1.32	0.33	2.95	2.15	0.20	7.95	5.42	0.68
	99-12	0.46	1.40	0.36	0.37	0.86	0.56	0.29	1.11	0.44	0.65	1.40	0.39
Idiosyncratic effects	81-12	1.56	0.72	2.20	0.32	0.16	0.58	1.01	0.75	1.58	1.17	0.72	1.36
	81-96	10.82	3.82	2.15	1.59	0.84	0.36	4.12	1.77	1.37	5.83	5.13	0.80
	99-12	1.58	1.98	1.40	0.48	0.40	0.20	1.52	1.86	1.52	1.48	1.85	1.16
Covariance term	81-12	-2.09	-0.48	-1.92	-0.15	0.15	-0.11	-0.58	-0.17	-0.92	-1.37	-0.42	-1.05
	81-96	-18.73	-6.80	-1.77	-2.63	-1.16	0.30	-6.08	-2.92	-0.57	-12.78	-9.55	-0.47
	99-12	-1.05	-2.38	-0.76	0.15	-0.26	0.24	-0.80	-1.97	-0.96	-1.12	-2.25	-0.55
Excess credit reallocation													
Sectoral effects	81-12	1.08	0.93	1.34	0.99	0.77	1.10	0.79	0.53	1.29	2.39	1.70	2.50
	81-96	3.71	2.20	1.20	1.55	1.00	0.85	1.77	0.93	1.08	6.62	3.60	1.70
	99-12	1.87	2.04	0.51	1.35	1.24	0.66	1.69	1.58	0.73	4.37	3.35	2.02
Idiosyncratic effects	81-12	0.40	0.43	0.87	0.06	0.09	0.30	0.33	0.39	0.97	0.85	0.69	1.10
	81-96	3.52	0.99	0.75	0.52	0.15	0.22	1.73	0.18	0.85	3.85	1.08	0.67
	99-12	0.60	0.48	0.89	0.09	0.18	0.19	0.53	0.46	1.15	1.69	1.49	1.13
Covariance term	81-12	-0.49	-0.35	-1.21	-0.05	0.14	-0.41	-0.12	0.08	-1.26	-2.24	-1.39	-2.59
	81-96	-6.23	-2.19	-0.94	-1.07	-0.15	-0.07	-2.51	-0.11	-0.93	-9.48	-3.68	-1.37
	99-12	-1.48	-1.51	-0.41	-0.44	-0.42	0.15	-1.23	-1.04	-0.88	-5.06	-3.84	-2.16

Notes: Panel A of this table shows the standard deviation (s.d.) and the coefficient of variation (s.d./mean\*100) of the credit flows. Panel B shows the variance decomposition of the gross and excess reallocation of total credit, loans and bonds.

TABLE 4  
Cyclical Behavior of Credit Flows

Panel A: Correlation of credit reallocation with GDP growth and decomposition										
	t-2	t-1	t	t+1	t+2	t-2	t-1	t	t+1	t+2
Total credit										
1981-1996										
corr (SUM,GDP)	0.004	-0.012	0.280	-0.243	-0.152	1999-2012				
<i>Decomposition</i>										
corr (EXC,GDP)	0.182	-0.159	0.084	0.133	0.450	0.101	0.025	0.384	0.614*	0.063
sd(EXC)/sd(SUM)	1.165	1.165	1.165	1.165	1.165	1.108	1.108	1.108	1.108	1.108
corr ([NET],GDP)	-0.136	0.113	0.119	-0.261	-0.443	0.002	0.112	-0.173	-0.585	0.087
sd([NET])/sd(SUM)	1.526	1.526	1.526	1.526	1.526	1.484	1.484	1.484	1.484	1.484
Total credit (excluding 2008)										
1981-1996										
corr (SUM,GDP)	0.004	-0.012	0.280	-0.243	-0.152	1999-2012				
corr (EXC,GDP)	0.182	-0.159	0.084	0.133	0.450	0.153	0.083	0.316	0.464	0.390
Loans										
1981-1996										
corr (SUM,GDP)	0.282	-0.011	0.160	0.051	-0.104	1999-2012				
corr (EXC,GDP)	0.281	0.058	0.106	0.181	0.425	0.023	0.254	0.070	0.153	0.050
Bonds										
1981-1996										
corr (SUM,GDP)	0.128	-0.139	0.153	0.324	0.423	1999-2012				
corr (EXC,GDP)	0.046	-0.167	0.338	0.179	0.505*	0.290	0.125	0.366	0.313	-0.076
Panel B: Correlation of reallocation of total credit with GDP growth by size quintiles										
1981-1996										
All firms										
corr (EXC,GDP)	0.182	-0.159	0.084	0.133	0.450	0.101	0.025	0.384	0.614*	0.063
1st size quintile										
corr (EXC,GDP)	0.513	-0.449	-0.378	-0.288	-0.026	-0.118	0.222	-0.285	-0.195	-0.184
2nd size quintile										
corr (EXC,GDP)	0.572	-0.361	-0.347	-0.239	0.127	0.256	0.124	0.172	0.355	0.341
3rd size quintile										
corr (EXC,GDP)	0.588	-0.147	0.137	0.382	0.554	0.111	-0.074	0.373	0.525	0.312
4th size quintile										
corr (EXC,GDP)	0.421	0.001	0.125	0.159	0.435	0.348	-0.083	0.243	0.508	0.181
5th size quintile										
corr (EXC,GDP)	-0.042	-0.194	0.097	0.441	0.580	0.072	-0.049	0.493	0.667	-0.020

Notes: This table, Panel A, reports the correlation coefficients of the gross and excess reallocation of total credit, loans and bonds with the GDP growth rate. It also reports the same correlation for total credit after excluding 2008. The Panel displays correlations for the pre-crisis (1981-1996) period and for the post-crisis (1999-2012) period. For the gross reallocation of total credit, Panel A also reports the decomposition of its correlation with the GDP growth rate. Panel B of the table displays the correlation coefficients of the excess reallocation of total credit with the GDP growth rate, by size (sales) quintiles. \* denotes statistical significance at the 5% level.

TABLE 5  
Debt Changes, Cyclicity and Role of Firm Characteristics

Panel A: Debt changes, role of cyclicity and profitability (baseline regressions, by size quintiles)										
	1987-2012	1987-1996	1999-2012	1987-2012	1987-2012	1987-2012	1987-1996	1999-2012	1987-2012	1987-2012
	Total credit			Loans	Bonds	Total credit			Loans	Bonds
	<i>Debt cyclicity by firms' size</i>					<i>Debt response to firm profitability by firms' size</i>				
1st size quintile	0.0636** (0.00624)	0.0698** (0.00907)	0.0563** (0.00640)	0.0500** (0.00520)	-0.0034** (0.00075)	0.00051** (3.20e-05)	0.0007** (0.00010)	0.0005** (3.59e-05)	0.00018** (2.63e-05)	4.13e-06 (2.88e-06)
2nd size quintile	0.0420** (0.00521)	0.0589** (0.00847)	0.0300** (0.00476)	0.0387** (0.00440)	-0.0025** (0.00075)	0.00039** (2.94e-05)	0.0007** (9.28e-05)	0.0003** (3.33e-05)	0.00012** (2.44e-05)	-4.99e-06 (3.28e-06)
3rd size quintile	0.0414** (0.00501)	0.0405** (0.00767)	0.0185** (0.00446)	0.0307** (0.00419)	-0.00131 (0.00082)	0.00049** (3.00e-05)	0.0006** (9.10e-05)	0.0004** (3.42e-05)	0.00017** (2.48e-05)	7.94e-06* (3.94e-06)
4th size quintile	0.0436** (0.00506)	0.0256** (0.00783)	0.0089* (0.00439)	0.0260** (0.00429)	0.0027** (0.00102)	0.00054** (3.16e-05)	0.0007** (0.00011)	0.0005** (3.56e-05)	0.00020** (2.56e-05)	1.53e-05** (4.87e-06)
5th size quintile	0.0402** (0.00513)	0.0123 (0.00721)	-0.0110** (0.00410)	0.0374** (0.00433)	0.0010 (0.00145)	0.00063** (3.25e-05)	0.0009** (0.00010)	0.0005** (3.62e-05)	0.00025** (2.54e-05)	4.52e-05** (5.99e-06)
Panel B: Debt changes, role of other firm characteristics (extended regressions, by size quintiles)										
	<i>Debt response to firm liquidity (working capital ratio) by firms' size</i>					<i>Debt response to firm liquidity (current asset ratio) by firms' size</i>				
1st size quintile	-1.10e-06 (2.32e-06)	-0.00018** (5.91e-05)	-8.09e-07 (2.03e-06)	-1.62e-07 (1.66e-06)	4.76e-08 (3.16e-08)	-0.0719** (0.0130)	-0.0374 (0.0339)	-0.0925** (0.0180)	-0.0942** (0.0152)	-0.0029** (0.0009)
2nd size quintile	-2.45e-05** (4.64e-06)	-0.00018** (4.60e-05)	-2.30e-05** (4.62e-06)	-1.64e-05** (3.44e-06)	-2.90e-08 (1.51e-07)	0.00038 (0.0102)	-0.0419 (0.0268)	-0.0165 (0.0137)	-0.0302** (0.0085)	-0.00185* (0.0008)
3rd size quintile	-2.09e-06 (1.81e-06)	-0.00015** (3.14e-05)	-1.89e-06 (1.67e-06)	-1.38e-06 (1.34e-06)	2.60e-08 (2.60e-08)	-0.0057 (0.0086)	-0.0278 (0.0277)	-0.0108 (0.0116)	-0.0254** (0.0074)	-0.0017 (0.0010)
4th size quintile	-1.61e-05** (3.98e-06)	-0.00018** (5.26e-05)	-1.57e-05** (4.22e-06)	-1.40e-05** (3.03e-06)	2.16e-07 (2.13e-07)	0.0128 (0.0084)	-0.0091 (0.0232)	0.0113 (0.0115)	-0.0032 (0.0071)	-0.0012 (0.0012)
5th size quintile	-8.46e-07 (2.64e-06)	-0.00029** (6.49e-05)	-9.05e-07 (2.58e-06)	2.16e-07 (2.28e-06)	3.22E-07 (1.71e-07)	0.0365** (0.0111)	0.0041 (0.0317)	0.0366* (0.0156)	0.016 (0.0095)	0.0010 (0.0016)
Panel C: Debt changes, role of cyclicity (baseline regressions, by other firm classifications)										
	1987-2012	1987-1996	1999-2012	1987-2012	1987-1996	1999-2012	1987-2012	1987-1996	1999-2012	
	Total credit			Total credit			Total credit			
	<i>Debt cyclicity by firms' governance</i>			<i>Debt cyclicity by firms' liquidity</i>			<i>Debt cyclicity by firms' profitability and efficiency</i>			
Non-chaebol	0.0409** (0.00295)	0.1160** (0.01330)	0.0365** (0.00498)	0.0375** (0.00639)	0.0273** (0.00901)	0.0144* (0.00596)	1st profitability quintile	0.00677 (0.00591)	0.00394 (0.00820)	0.00934 (0.00540)
Chaebol	0.0528** (0.00967)	0.1150** (0.02580)	0.0256 (0.0198)	0.0573** (0.00628)	0.0412** (0.00878)	0.0237** (0.00625)	2nd profitability quintile	0.0230** (0.00573)	0.0234** (0.00812)	0.0133* (0.00559)
				0.0593** (0.00630)	0.0273** (0.00846)	0.0294** (0.00672)	3rd profitability quintile	0.0381** (0.00577)	0.0225** (0.00850)	0.0171** (0.00567)
				0.0767** (0.00662)	0.0499** (0.00907)	0.0399** (0.00723)	4th profitability quintile	0.0521** (0.00624)	0.0473** (0.00915)	0.0261** (0.00624)
				0.0633** (0.00695)	0.0510** (0.00889)	0.0504** (0.00796)	5th profitability quintile	0.0709** (0.00782)	0.0629** (0.0113)	0.0421** (0.00784)
							1st sales/capital quintile	0.0550** (0.00576)	0.0319** (0.00968)	0.0136** (0.00496)
							2nd sales/capital quintile	0.0357** (0.00558)	0.0349** (0.00859)	0.0106* (0.00508)
							3rd sales/capital quintile	0.0441** (0.00482)	0.0347** (0.00821)	0.00358 (0.00501)
							4th sales/capital quintile	0.0371** (0.00474)	0.0476** (0.00904)	0.00794 (0.00570)
							5th sales/capital quintile	0.0363** (0.00525)	0.0468** (0.0118)	0.00517 (0.00752)

Notes: This table shows the coefficient estimates of firm level credit changes on the GDP growth rate (cyclicity), on Tobin's q (profitability) and on other firms characteristics. Panel A reports estimates from the regression in (10) for sales quintiles. Panel B reports estimates from the regression in (10) augmented with other firm characteristics for sales quintiles. Panel C reports estimates for firms' subsamples by firm governance (chaebol and non-chaebol-firms), profitability and efficiency, liquidity. The numbers in parentheses denote standard errors. \* and \*\* indicate 5 % and 1% statistical significance. The 1st and the 5th size quintile are the quintiles of the smallest and the largest firms, respectively (and similarly for other firm characteristics).



Modified the approach suggested by Galindo et al (JDE, 2007)

$$I_{it} = \frac{\sum_{f=1}^F \frac{s_{fit}}{k_{fit}} \frac{c_{fit}}{C_{fit}}}{\sum_{f=1}^F \frac{s_{fit}}{k_{fit}} \frac{c_{fit-1}}{C_{fit-1}}} \quad (1)$$

where  $f$ ,  $i$  and  $t$  denote a sub-group, a firm and year.

Three efficiency measures: 1) sales to capital ratio, 2) profit to capital ratio

In terms of each efficiency measure, examine how credit is reallocated to efficient firms from inefficient firms compared to last year.

$I_{it} > 1$ : efficiency improved relative to previous year

$I_{it} < 1$ : efficiency deteriorated relative to previous year

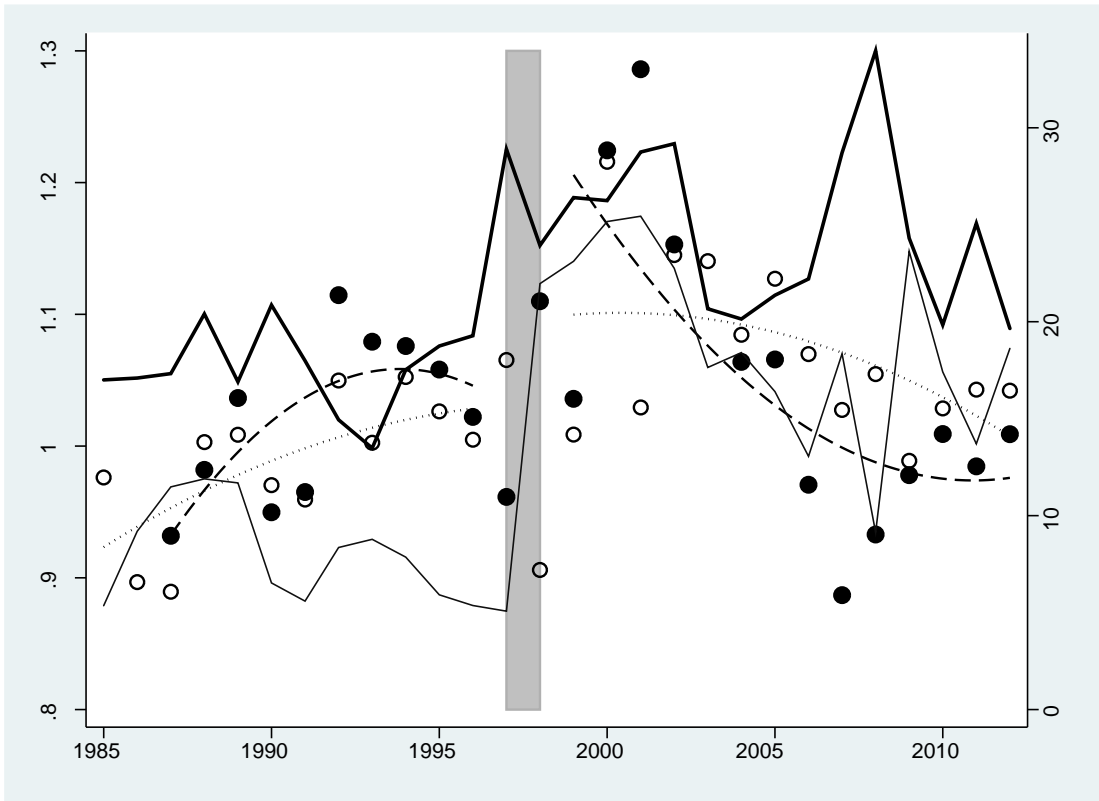
# Efficiency of Credit Reallocation

Efficiency of Credit Reallocation decreased during the credit boom (1993 to 1996)

increased after financial crisis (during the credit bust process)

decreased during the credit boom process

**Figure 4. Efficiency of Credit Reallocation**



**Notes:** The figure shows the annual values of two efficiency indexes of credit reallocation computed using firms' sales to capital ratios (circles) 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 and dashed lines for profits). The efficiency index using profit to capital ratios 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).

Table 6  
Efficiency of Credit Reallocation

		All	Chaebol affiliation		Size quintile				
Panel A: Total credit			Chaebols	Non-chaebols	1st	2nd	3rd	4th	5th
		Operating profits							
Average	87-96	1.022	0.958	1.004	0.490	0.420	0.462	0.385	0.481
	99-12	1.120	1.163	0.947	0.926	0.765	0.980	0.924	0.474
		Sales							
Average	85-96	0.987	0.948	0.957	1.202	1.589	1.364	1.010	0.770
	99-12	1.072	1.030	1.004	1.381	1.179	1.321	1.297	0.584
Panel B: Loans			Chaebols	Non-chaebols	1st	2nd	3rd	4th	5th
		Operating profits							
Average	87-96	1.038	0.942	0.983	0.513	0.432	0.444	0.436	0.518
	99-12	1.129	1.011	0.977	0.767	0.745	0.977	0.845	0.659
		Sales							
Average	85-96	1.012	0.965	0.980	1.127	1.688	1.399	1.012	0.798
	99-12	1.078	1.058	0.982	1.440	1.167	1.363	1.209	0.625

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 and the post-crisis periods.

## Summary

Explored the dynamic pattern of credit reallocation in credit boom-bust processes

Structural change in credit reallocation: intensity, volatility, cyclicity, dynamic factor (variance decomposition)

## Policy implications

Policies implemented in financial markets during the 1997 crisis made the credit markets more flexible in the process of credit reallocation