

Appendix 1: Composition of Assets of Banking System in 2008 and 2014

This appendix provides details on the composition of the assets of the Chinese banking system, which we define as banks and trusts. We provide these numbers for 2008 and 2014, but Figure 8 plots a subset of these numbers for all years between 2008 and 2014.

Table A1: Decomposition of Total Assets of China's Banking Sector (trillion Yuan)

	2008	2014	Source
Total Assets	58.2	160.8	
Reserve Assets	9.4	23.3	Balance sheet of other depository corporations
Central Bank Bonds	5.3	9.6	Balance sheet of other depository corporations
Domestic Government Bonds	4.3	0.7	China Statistical Yearbook
Lending to the Non-Financial Sector	39.2	127.2	China's National Bureau of Statistics
Lending to Households	5.7	22.9	Balance sheet of other depository corporations
Total Lending to LFVs	9.4	38.4	WIND
"Official" Lending to LFVs	5.6	21.5	National Audit Office and Ministry of Finance
Lending to Firms (excluding LFVs)	24.1	65.9	Residual of lending to households and LFVs

Total assets consist of reserve assets (row 1), central bank bonds (row 2), domestic government bonds (row 3), and lending to the non-financial sector (including loans to local financing vehicles) (row 4). Data on reserve assets and central bank bonds are provided by the central bank's data on balance sheet of "other depository institutions". We assume that only "other depository institutions" hold reserve assets and central bank bills. The numbers on government bonds are from China Statistical Yearbook.

Total lending to non-financial institutions (including local financing vehicles) are imputed from "social financing" released by China's National Bureau of Statistics. "Social financing" is a flow number, available since 2002, about the amount of total fund that the real economy gets from the financial sector. It includes bank loans, bonds, trust and entrusted loans, undiscounted bank's acceptance and equity financing. We use the stock of bank loans in 2001 and the ratio of new bank loans to social financing in 2002 (about 90%) to infer the stock of total lending to

non-financial institutions in 2001. We exclude equity financing, which is less than 3% of social financing.

We further decompose total lending to non-financial institutions into lending to households, LFVs, and corporations. Lending to households is from the central bank's data on balance sheet of "other depository institutions". We assume that only "other depository institutions" lend to households. Total Lending to LFVs is imputed from the WIND micro-data. Official Lending (which is a subset of total lending to LFVs) is measured by the data from National Audit Office and the Ministry of Finance (see the text for details).

Appendix 2: Estimation of Debt of “Hidden” LFVs

The WIND dataset collects the public information of the firms that have issued or will issue bond.¹ Moreover, it identifies LFVs by (i) shareholder of the bond issuer being local government or subsidiary of local government; and (ii) the business of the bond issuer covering local infrastructure or public utilities. Debt is measured by total liabilities on the consolidated balance sheet. Notice that both holding companies and their subsidiaries may enter into the dataset. To avoid double counting, we drop the LFVs that are owned by other LFVs in the dataset. Specifically, we identify parent-subsidiary relationship by (i) the ownership information provided by WIND and (ii) checking manually firm names. We find 157 subsidiaries out of 1884 LFVs. We refer to the remaining LFVs in the WIND dataset as WIND LFVs.

Table A2: Summary Statistics

	(1)	(2)	(3)	(4)	(5)	(6)
	# of WIND LFVs	Total Debt (trillion Yuan)	# of New WIND LFVs	Average Debt of New WIND LFVs (billion Yuan)	# of Incumbent WIND LFVs	Average Debt of Incumbent WIND LFVs (billion Yuan)
2006	263	2.4	263	9.2	0	-
2007	413	3.8	154	5.2	259	11.7
2008	576	5.4	163	4.2	413	11.4
2009	901	9.3	326	4.8	575	13.4
2010	1155	12.5	256	3.8	899	12.9
2011	1445	15.6	290	2.7	1155	12.8
2012	1652	19.6	209	2.4	1443	13.3
2013	1701	24.0	65	4.6	1636	14.5
2014	1711	29.9	22	20.7	1689	17.4
2015	1688	35.2	6	6.1	1682	20.9

Note: New WIND LFVs are defined as those that enter into the WIND dataset for the first time. Column (3) shows the number of new WIND LFVs falls dramatically after 2013. Recall that for a firm to issue bond, it will have to release its financial statement over the past three to five years. We will thus expect to see more new WIND LFVs in 2013-2015 in the future WIND Dataset that includes firms issuing bond in 2016 and onwards.

The 2011 and 2013 NAO’s surveys cover 6,576 and 7,170 LFVs, while there are about 1,700 WIND LFVs. Our goal is to back out the size of the “hidden” LFVs that are not in the WIND dataset. The entrants that change their status from being “hidden” to WIND LFVs are particularly important for our identification.

By Columns (4) and (6), one can find the entrants to be smaller over time. The average debt of new LFVs relative to that of the incumbent is down from 45% in 2007 to 32% in 2013. The absolute debt level also drops from 5.2 trillion Yuan in 2007 to 4.6 trillion Yuan in 2013. This is consistent with a model where issuing bond involves a fixed cost and, hence, larger LFVs tend to enter the WIND dataset earlier. Moreover, as the fixed cost goes down, the average size of the new and hidden LFVs will become smaller over time.

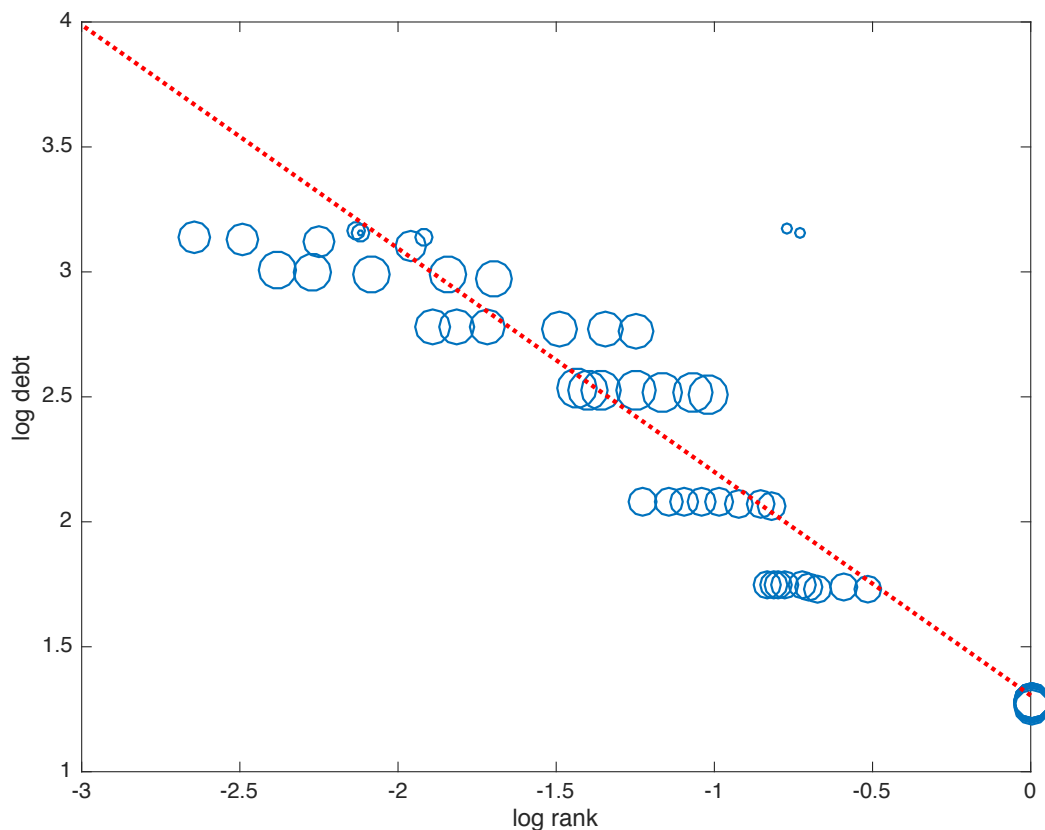
¹ To issue bond, firms need to publicize their financial statement over the past three to five years.

Let us start with a static environment. Assume that the debt of LFV follows a distribution, $F(d)$, where F is the cumulative density function and d stands for debt. There is a fixed cost for bond issuance such that only LFVs with $d > \underline{d}$ will enter the WIND dataset. The number of WIND LFVs as a share of the number of all LFVs is thus equal to $1 - F(\underline{d})$.

We next introduce time dimension. Assume that the fixed cost goes down over time such that $\underline{d}_t < \underline{d}_{t-1}$. The proportion of the new WIND LFVs in period t is equal to $F(\underline{d}_{t-1}) - F(\underline{d}_t)$, while the proportion of the incumbent WIND LFVs that enter into the dataset at period $t - i$ is equal to $F(\underline{d}_{t-i-1}) - F(\underline{d}_{t-i})$. For notational convenience, the WIND LFVs that enter into the dataset at period $t - i$ are referred to as group (t, i) . We use the sample from 2007 to 2015. There are two groups in 2007, one entering in 2006 and the other entering in 2007. The number of groups increases to 9 in 2015. There are a total of 54 groups in the sample.

Estimation strategy: We use the number of LFVs in group (t, i) to measure $F(\underline{d}_{t-i-1}) - F(\underline{d}_{t-i})$ in year t . Their average debt gives the mean of $\underline{d}_{t-i-1} - \underline{d}_{t-i}$. We assume the number of all LFVs to be a constant and equal to 7170 (the number of LFVs covered by the 2013 NAO's survey). We find the Zipf's law to be a good fit for the debt distribution. Figure A1 plots the log rank (in percentile) of the average debt in group (t, i) in a year against the log average debt in that group relative to the log average debt of the group (2007,0). A simple OLS regression finds the coefficient of the Zipf's law to be -1.12, with the R square of 0.90.

Figure A1: Log Rank and Debt of LFVs in Group (t, i)



Note: The size of the dot reflects the number of LFVs in each group.

We now can back out the total debt of the hidden LFVs as a share of that of the WIND LFVs. Figure A2 plots the results.

Figure A2: The Total Debt of the Hidden LFVs as a Share of Total Debt of the WIND LFVs

