

Online Appendix

"The Financing of Local Government in China: Stimulus Loan Wanes and Shadow Banking
Waxes?"

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This Online Appendix consists of four sections. In Section A, we describe how we estimate the sector-level stimulus bank loans extended in 2009. In Section B, we provide data-construction details of total local government debt balance and its four major components. In Section C, we discuss all government documents issued by the State Council in 2009. In Section D, we describe how we estimate the investment of wealth management products in municipal corporate bonds. In Section E, additional results are presented.

Appendix A. Estimates of Sector-Level Stimulus Bank Loans in 2009

We estimate that the 2009 stimulus caused RMB 4.7 trillion additional bank loans to the entire Chinese economy, among which, about 2.3 trillion went to LGFVs, about RMB 1 trillion went to the non-residential sector (but excluding LGFVs), and the remaining RMB 1.4 trillion went to the residential sector. Note that the estimated stimulus LGFV bank loans (i.e., 2.3 trillion) square well with [Gao, Ru, and Tang \(2018\)](#), who have detailed loan-level information for LGFVs from the largest nineteen banks (eighteen commercial banks and China Development Bank) in 2009. Finally, with the help of the data in [Gao, Ru, and Tang \(2018\)](#), we estimate that for the RMB 2.3 trillion in bank loans to LGFVs, RMB 2.06 trillion came from commercial banks and RMB 0.24 trillion came from policy banks.

The detailed steps to construct the above estimates are as follows. First, the total stimulus bank loans (RMB 4.7 trillion) is the difference between the actual 2009 new bank loans (9.6 trillion) and the estimated 2009 normal new bank loans (RMB 4.9 trillion, based on the average BL/GDP ratio in 2004–2008). Following the same approach, the 2009 non-residential stimulus bank loan is estimated at RMB 3.3 trillion, implying the residential stimulus bank loan is RMB 1.4 trillion (4.7–3.3). Second, we decompose this RMB 3.3 trillion number further into LGFVs and the rest.

To this end, we estimate the 2009 normal new bank loan to LGFVs to be RMB 0.75 trillion (the ratio of LGFV new bank loans over new bank loans in 2008 multiplied by the estimated 2009 normal new bank loans; the 2008 LGFV new bank loans are based on the 2010 national audit report and WIND). Subtracting this value from the 2009 actual LGFV bank loans 3.05 trillion (Bai, Hsieh, and Song, 2016, p.14), we estimate the 2009 LGFV stimulus bank loans to be RMB 2.3 trillion (3.05–0.75), which then leaves the 2009 non-residential (excluding LGFV) stimulus bank loans to be 1 trillion (3.3–2.3).

Appendix B. Construction of Local Government Debt Balance

B.1. Total local government debt balance

1. The numbers as of the end of 2010, 2012, and 2013H1 are provided by two auditing reports (2011 and 2013) on local government debt issued by the National Audit Office (NAO).
2. The numbers as of the end of 2008 and 2009 are calculated according to local government debt growth given in Figure 2 of the 2011 NAO report.
3. The number as of the end of 2014 is from the proposal to the State of Council submitted by the Ministry of Finance (MOF), which says that by the end of 2014, the local governments' full obligation was RMB 15.4 trillion and the total local government guaranteed/contingent liability was RMB 8.6 trillion.
4. The numbers as of the end of 2015/2016 are calculated according to the 2015/2016 local government full obligation of RMB 16/17.1 trillion and the 2014 fraction of the local governments' full obligation as the total local government debt.
5. The numbers as of the end of 2011 and 2013 are interpolated assuming the growth rate of local government debt to be constant between 2010 and 2012, and between 2012 and 2014.

B.2. Local government bank loan balance

1. The numbers as of the end of 2010 and June 2013 are from the two NAO reports.

2. The numbers as of the end of 2008, 2009, 2011, and 2012 are adjusted from the LGFV bank loan balance data available from WIND.
 - (a) The ratio between the average 2010 and June 2013 local government bank loan balance from the NAO reports, and the average 2010 and June 2013 LGFV bank loan balance is used as the adjustment factor.
 - (b) LGFV bank loan balance data are from WIND as of the end of 2008, 2009, and 2012.
 - (c) The LGFV bank loan balance as of the end of 2011 is interpolated, assuming the growth rate between 2010 and 2012 to be constant.

3. The numbers as of the end of 2013, 2014, 2015, and 2016 are adjusted from the LGFV bank loan balance estimated using China Construction Bank's (CCB) LGFV balance.
 - (a) The country-wide LGFV bank loan balance in commercial banks' measurement as of the end of 2013–2016 is estimated using CCB's LGFV bank loan balance and CCB's bank loan balance share of all commercial banks.
 - (b) The growth rates of the country-wide LGFV bank loan balance in commercial banks' measurement are used to estimate the LGFV bank loan balance in the WIND measurement from 2013 to 2016.
 - (c) The value of the local government bank loan balance as of the end of 2013–2016 is estimated from section 3(b) LGFV bank loan balance adjusted by section 2(a) adjustment factor.

B.3. Municipal corporate bond balance

1. Individual municipal corporate bonds, both outstanding and matured, are aggregated over their corresponding outstanding periods to calculate the MCB balance as of the end of each year.

B.4. Municipal bond balance

1. Individual municipal bonds, both outstanding and matured, are aggregated over their corresponding outstanding periods to calculate the municipal bond balance as of the end of each year.

B.5. Local government trust financing balance

Municipality-trust cooperation balance data are reported officially by China Trustee Association. We assume that the fraction of municipality-trust cooperation outstanding over total Trust loans remains constant over years.

1. Quarterly municipality-trust cooperation balance data are available since 2010.
2. As of June 30, 2013, the NAO report shows that the total local government trust financing balance is RMB 1.43 trillion and the municipality-trust cooperation balance is RMB 0.8 trillion. The adjustment factor is therefore $1.43/0.8 = 1.77$.
3. The numbers of Municipality-Trust cooperation balance as of the end of 2010–2016 are multiplied by 1.77 to reflect the total local government trust financing balance.

Appendix C. Government Documents Issued by the State Council in 2009

The State Council of the People’s Republic of China lists all documents on its website (url: http://www.gov.cn/zhengce/content/node_330.htm). In 2009, a total of 103 documents were issued by the State Council. Among all the 103 documents, 29 are classified in the categories of macro economic management, finance, employment, and general government service. Among these twenty-nine documents, eight of them are related to macroeconomic and finance issues that are relevant to our paper, mainly on stimulating economic development and dealing with the financial crisis. Table A.5 presents all eight relevant documents, whose objectives include promoting economic growth and employment in general (No. 4, No. 13, No. 26), providing guidance for the development of some specific industries (No. 8, No. 27, No. 38), promoting the development of

small- and medium-sized firms (No. 36), and stimulating growth for some geographic area (No. 55).

For the remaining twenty-one documents, they are announcements or notices on other economic aspects, such as social welfare (No. 32 Document, “Guiding Opinions of the State Council on Launching a Pilot Program for New Rural Social Pension Insurance”), work plan (No. 23 Document, “Notice of the State Council on Carrying out the Sixth National Population Census”), and miscellaneous (No. 35 Document, “Opinions of the General Office of the State Council on Further Strengthening the Management of Government Procurement”).

Appendix D. Construction of Wealth Management Product Investment in Municipal Corporate Bonds

1. Total MCB balance by rating (AAA, AA+, AA, and \leq AA) is aggregated from individual MCBs using bonds rating at issuance. If a bond does not have rating information at issuance, we use its issuer’s rating at issuance as a proxy. Only 1.57% of MCB in terms of RMB issuance value do not have any rating information.
2. Total credit bond balance by rating (AAA, AA+, AA, and \leq AA) is from China Central Depository and Clearing Corporation, downloaded from WIND.
3. Credit bond balance by rating (AAA, AA+, AA, and \leq AA) held by WMPs is from *China Commercial Banks’ Wealth Management Products Annual Reports* issued by China Banking Wealth Management Registration System.
4. Fractions of credit bond balance held by WMPs by rating are calculated from numbers in 2 and 3.
5. Assuming that WMPs hold MCBs in the same ratio as WMPs hold all corporate bonds, we estimate the MCB balance held by WMPs from numbers in 1 and 4.

Appendix E. Additional Results

Table A1: Original NAO reports on China's local government debt

This table reports sources of local government debt from two original reports issued by the National Auditing Office of China. Panel A (B) reports the auditing results as of December 31, 2010 (June 30, 2013).

Panel A: Local government debt balance as of December 31, 2010 (billion RMB)

	Full Obligation	Contingent Liability		Total Debt
		Guaranteed Obligation	Contingent Bailout Obligation	
Bank loan	5,023	1,913	1,532	8,468
Fiscal on-lending	213	235	0	448
Bond	551	107	99	757
Other entity and individual borrowing	924	82	39	1,045
Total	6,711	2,337	1,670	10,717

Panel B: Local government debt balance as of June 30, 2013 (billion RMB)

	Full Obligation	Contingent Liability		Total Debt
		Guaranteed Obligation	Contingent Bailout Obligation	
Bank loan	5,525	1,909	2,685	10,119
Build & transfer	1,215	47	215	1,476
Bond	1,166	167	512	1,846
MuniBond	615	49	0	664
Enterprise bond	459	81	343	883
Mid-term note	58	34	102	194
Commercial paper	12	1	22	35
Other types	22	2	45	70
Accounts payable	778	9	70	857
Trust	762	253	410	1,425
Other entity and individual borrowing	668	55	116	839
Construction loan	327	1	48	376
Other financial institution borrowing	200	31	106	337
Fiscal on-lending	133	171	0	303
Capital lease	75	19	137	232
Other fund raising	37	4	39	80
Total	10,886	2,666	4,339	17,891

Table A2: Summary statistics of municipal corporate bond issuance

This table reports the summary statistics of MCB issuance. Panels A and B report MCB issuance number, issuance amount (RMB billion), and issuance amount by purpose (repayment of existing bank loan, investment, and other) for seven regions and thirty provinces, respectively. Total issuance amount is greater than the sum of these three purposes because only around 80% of MCBs are with disclosure.

Panel A: MCB issuance by region					
Province	Number of Bonds	Amount (total)	Amount (repay)	Amount (inv)	Amount (other)
Center China	554	635.9	105.0	318.9	54.0
East China	2428	2272.9	653.5	1019.9	242.3
North China	630	1004.7	260.3	332.6	155.8
South China	404	448.0	142.6	166.8	92.5
Northeast	245	292.5	53.5	158.1	22.9
Northwest	393	428.3	104.6	147.7	54.4
Southwest	800	845.1	249.2	348.9	95.7
Total	5454	5927.3	1568.7	2492.7	717.6

Panel B: MCB issuance by province

Province	Number of Bonds	Amount (total)	Amount (repay)	Amount (inv)	Amount (other)
Anhui	206	218.7	60.1	114.5	15.5
Beijing	210	368.0	102.1	99.2	97.2
Chongqing	265	287.8	90.5	119.5	28.8
Fujian	293	244.3	102.3	72.2	42.0
Gansu	78	97.6	22.9	28.9	16.8
Guangdong	232	303.2	115.7	106.6	63.3
Guangxi	165	135.6	26.0	52.7	28.3
Guizhou	89	118.1	15.3	73.5	12.1
Hainan	7	9.2	0.9	7.4	0.9
Hebei	93	98.4	14.0	52.7	13.9
Heilongjiang	58	61.4	4.8	41.4	6.2
Henan	143	156.3	23.5	63.5	16.4
Hubei	198	204.7	35.9	95.3	22.7
Hunan	213	274.9	45.6	160.0	15.0
Jiangsu	997	859.0	215.7	358.5	89.6
Jiangxi	136	140.2	32.2	82.2	13.3
Jilin	36	42.9	16.1	14.6	1.5
Liaoning	151	188.2	32.6	102.1	15.3
Neimenggu	64	70.5	7.4	46.3	5.7
Ningxia	9	12.1	1.4	9.0	0.7
Qinghai	36	44.9	22.2	12.6	5.1
Shan_xi	149	176.4	43.1	48.1	16.3
Shandong	251	273.3	83.3	136.6	22.1
Shanghai	165	202.3	84.1	60.0	29.4
Shanxi	51	67.7	5.7	30.3	10.5
Sichuan	275	265.5	93.2	97.8	33.2
Tianjin	212	400.0	131.0	104.1	28.4
Xinjiang	121	97.4	14.9	49.0	15.5
Yunnan	171	173.7	50.2	58.2	21.7
Zhejiang	380	335.0	75.9	195.9	30.4

Table A3: Summary statistics of city-level data

This table reports the summary statistics of key variables for city-level MCB issuance and economic conditions. Panel A reports the summary statistics of all variables over the full sample. Panels B and C report the summary statistics of MCB issuance over the 2004–2008 and the 2009–2015 subperiods. Dependent variables include MCB over GDP, MCB for repayment of bank loans over GDP, MCB for investment over GDP, and MCB for other purpose over GDP, all of which are scaled by the 2009 GDP. The main explanatory variable is stimulus bank loans, defined as 2009 bank loan over GDP minus its average value over the past five years. Control variables include fiscal deficit over GDP, fixed-asset investment over GDP, GDP growth, GDP per capita in RMB thousand, and the Big Four branch share, the former four of which are measured over 2008 and the last one is measured as of December 31, 2008. The sample period for dependent variables are from 2004 to 2015.

Panel A: Summary statistics of full sample

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	3900	0.008	0.024	0.000	0.000	0.000	0.004	0.330
$MCB_{i,t}^{repay}/GDP_{i,2009}$	3900	0.001	0.008	0.000	0.000	0.000	0.000	0.174
$MCB_{i,t}^{inv}/GDP_{i,2009}$	3900	0.004	0.012	0.000	0.000	0.000	0.000	0.277
$MCB_{i,t}^{other}/GDP_{i,2009}$	3900	0.001	0.004	0.000	0.000	0.000	0.000	0.083
$BL/GDP_{i,2009}^{stimulus}$	325	0.116	0.099	-0.476	0.063	0.100	0.156	0.810
$FD/GDP_{i,2008}$	325	0.119	0.154	-0.019	0.040	0.076	0.138	1.286
$FAI/GDP_{i,2008}$	325	0.559	0.192	0.124	0.440	0.525	0.660	1.307
$\Delta GDP_{i,2008}$	325	0.133	0.035	0.010	0.115	0.132	0.150	0.290
$GDP_{i,2008}^{capita}$	325	23.747	17.555	3.602	11.923	18.458	29.012	102.128
$BigFour_{i,2008}$	325	0.360	0.122	0.101	0.268	0.344	0.432	0.772

Panel B: Summary statistics of MCB issuance for the 2004–2008 subperiod

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	1625	0.000	0.001	0.000	0.000	0.000	0.000	0.020
$MCB_{i,t}^{repay}/GDP_{i,2009}$	1625	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$MCB_{i,t}^{inv}/GDP_{i,2009}$	1625	0.000	0.001	0.000	0.000	0.000	0.000	0.020
$MCB_{i,t}^{other}/GDP_{i,2009}$	1625	0.000	0.000	0.000	0.000	0.000	0.000	0.002

Panel C: Summary statistics of MCB issuance for the 2009–2015 subperiod

	Obs	Mean	SD	Min	P25	Median	P75	Max
$MCB_{i,t}/GDP_{i,2009}$	2275	0.014	0.030	0.000	0.000	0.000	0.019	0.330
$MCB_{i,t}^{repay}/GDP_{i,2009}$	2275	0.002	0.011	0.000	0.000	0.000	0.000	0.174
$MCB_{i,t}^{inv}/GDP_{i,2009}$	2275	0.007	0.014	0.000	0.000	0.000	0.011	0.277
$MCB_{i,t}^{other}/GDP_{i,2009}$	2275	0.001	0.006	0.000	0.000	0.000	0.000	0.083

Table A4: The first-stage regression of the IV estimation

This table reports the first-stage result of 2SLS regressions. $LateTerm_{2009}$ equals one if a province governor was not in the first two years of his or her tenure as of 2009, and zero otherwise. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and the Big Four branch share, the former four of which are measured from 2007Q4 to 2008Q3, and the last one is measured as of 2008Q3. Heteroskedasticity-consistent standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The effective first-stage F -statistic proposed by [Olea and Pflueger \(2013\)](#) is also reported.

	$BL/GDP_{2009}^{stimulus}$
$LateTerm_{2009}$	0.036* (0.020)
$FD/GDP_{i,07Q4-08Q3}$	0.348** (0.161)
$FAI/GDP_{i,07Q4-08Q3}$	0.118 (0.095)
$\Delta GDP_{i,07Q4-08Q3}$	-0.562 (0.480)
$GDP_{i,07Q4-08Q3}^{capita}$	0.002** (0.001)
$BigFour_{i,2008Q3}$	0.101 (0.153)
$F_{1st-stage}^{effective}$	3.100
Observations	30
Adj. R^2	0.259

Table A5: Documents issued by the State Council in 2009 on economic development
This table lists all eight documents issued by the State Council in 2009 that are related to stimulating economic development and dealing with financial crisis. The date of release, the document number, and the document title are presented.

Date	No.	Title
2009/2/10	4	Notice of the State Council on Doing a Good Job in Employment under the Current Economic Situation
2009/3/13	8	Notice of the State Council on Issuing the Adjustment and Revitalization Plan of the Logistics Industry
2009/3/23	13	Opinions of the State Council on the Assignment of Key Work among Departments for the Implementation of the Report on the Work of the Government
2009/5/25	26	Notice of the State Council on Approving and Relaying the Opinions of the National Development and Reform Commission on Key Work for Deepening the Reform of the Economic System in 2009
2009/5/27	27	Notice of the State Council on Adjusting the Capital Ratios for Fixed Asset Investment Projects
2009/9/22	36	Several Opinions of the State Council on Further Promoting the Development of Small- and Medium-sized Enterprises
2009/9/29	38	Notice of the State Council on Approving and Relaying the Opinions of the National Development and Reform Commission and Other Departments on Curbing Overcapacity and Redundant Construction in Some Industries and Guiding the Sound Development of Industries
2009/10/10	55	Opinions of the General Office of the State Council on Coping with the Global Financial Crisis and Maintaining Steady and Properly Rapid Economic Development in the Western Area of China

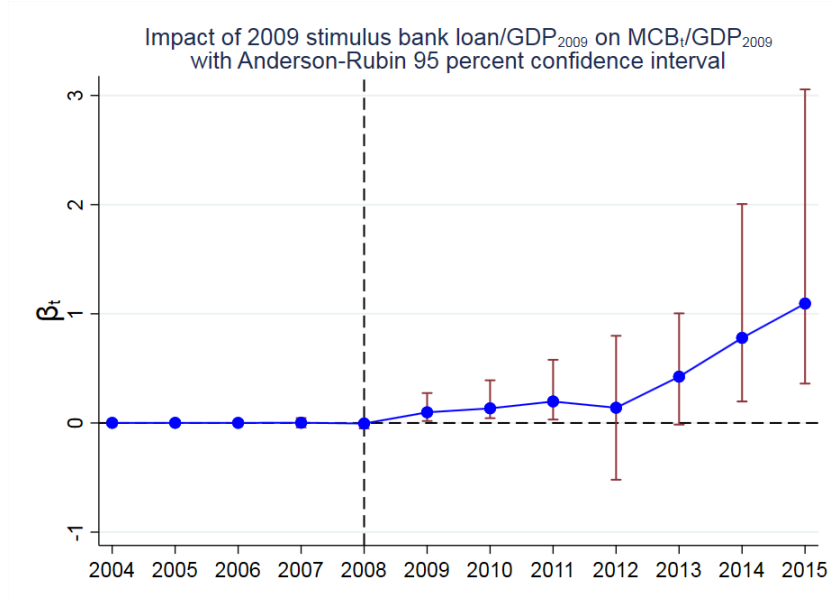


Fig. A1: Effects of instrumented 2009 stimulus bank loan on abnormal MCB issuance over 2009 GDP with Anderson-Rubin confidence intervals. This figure plots the coefficients along with the 95% AR confidence intervals for the year-by-year 2SLS regressions of abnormal MCB issuance over the 2009 GDP on the instrumented 2009 stimulus bank loan at province level. The instrumental variable $LateTerm_{2009}$ equals one if a province governor was not in the first two years of his or her governor tenure as of 2009, and zero otherwise. Control variables include fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and the Big Four branch share, the former four of which are measured from 2007Q4 to 2008Q3, and the last one is measured as of 2008Q3.

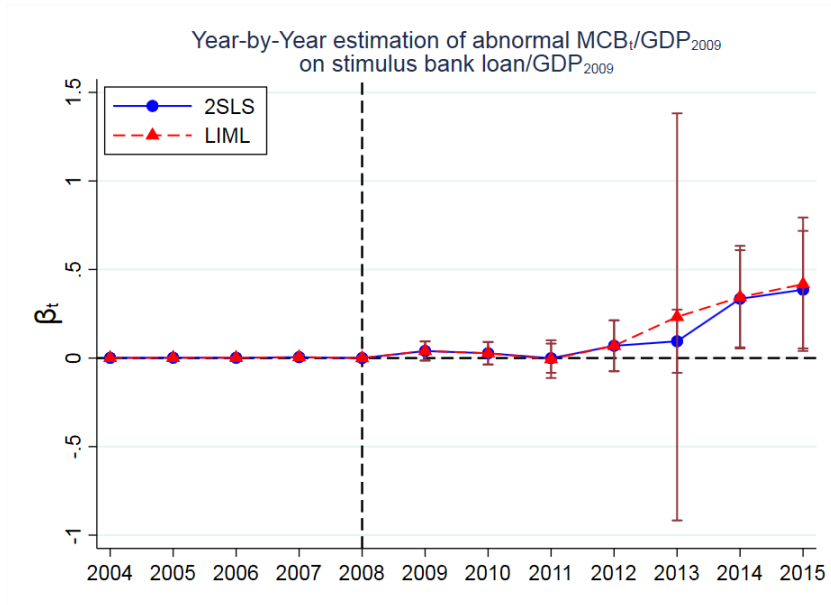


Fig. A2: Comparison of 2SLS estimator and LIML estimator. This figure plots the coefficients along with the 95% confidence intervals for the 2SLS and LIML estimators of abnormal MCB issuance over the 2009 GDP on the instrumented 2009 stimulus bank loan at city level. Two instrumental variables $LateTerm_{2009} / LateTerm_{2009}^{mayor}$ equal one if a province governor/city mayor was not in the first two years of his/her tenure as of 2009, and zero otherwise. Year-by-year 2SLS and LIML regressions are conducted with control variables including fiscal deficit scaled by GDP, fixed asset investment scaled by GDP, GDP growth, GDP per capita, and the Big Four branch share, the former four of which are measured in 2008, and the last one is measured as of December 31, 2008.