China's Real Estate Sector and the Macroeconomy: Inter-Sector Linkages and Risks

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Main Questions

- How close is the Chinese real estate sector correlated with different sectors?
- How do different sectors respond to a decline in real estate activities?
- Can we measure it?
- What risks do we see at the individual sectoral level?

Outline of the Talk

- Leads/Lags to show correlations
- An Input-Output (I-O) analysis to measure the influence
- Bank's balance sheet to examine potential risks

Leads/Lags of Sectors

- To present the common trend in a particular sector, we use Principle Component Analysis (PCA) to extract the first component
- The purpose is to show which indicators are leading indicators and how different sectors are correlated with the real estate sector

The 1st Component for the Real Estate Categories

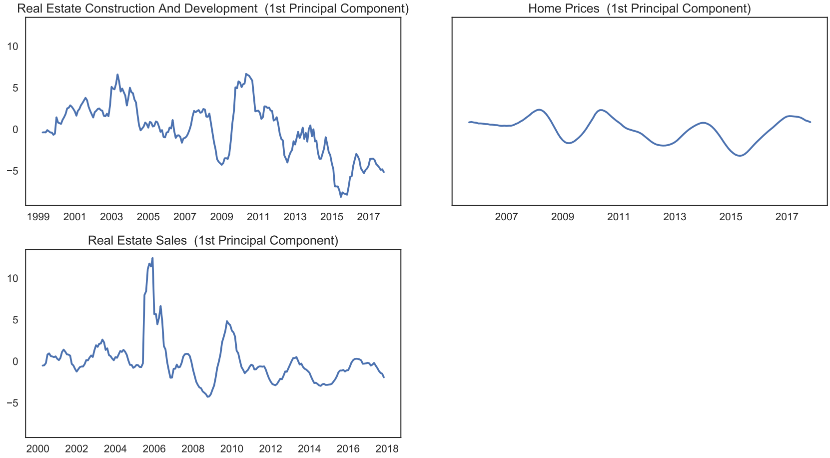
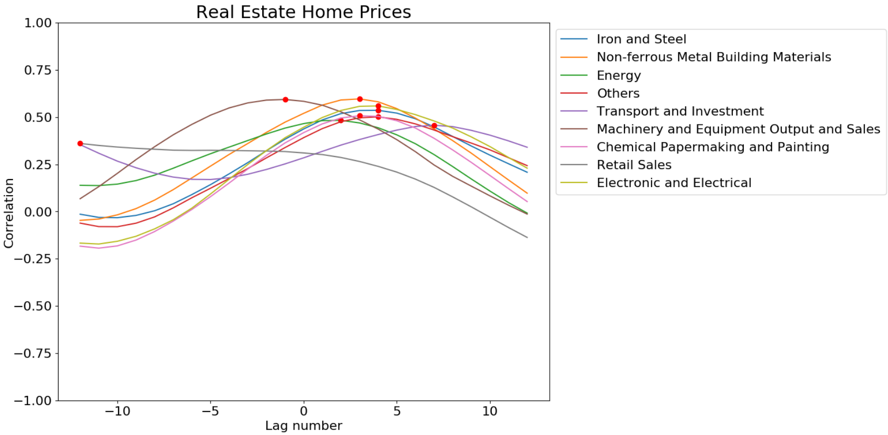
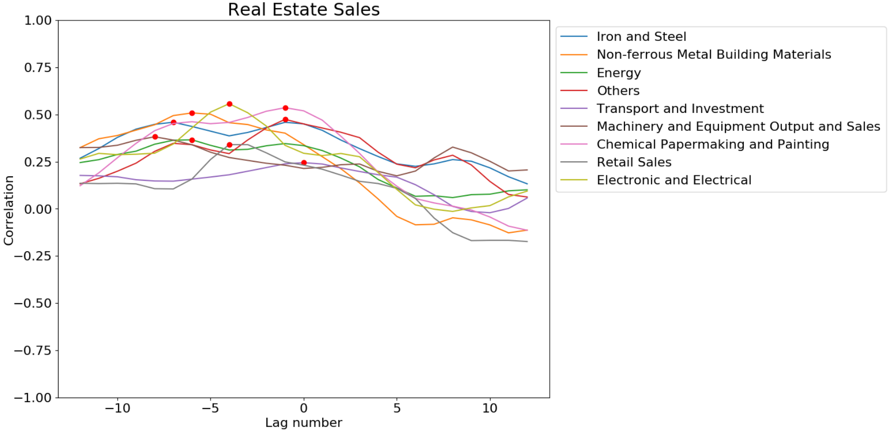


Figure: smoothed using 6m ma before the PCA analysis is conducted

Home prices *lag* most sectors



But home sales *lead* most sectors



Measuring Inter-Sector Linkages

- An I-O table shows how industries are dependent on each other.
- Suppose A is the interindustrial input matrix where $a_{i,j}$ is industry i's input in producing goods in industry j.
- Let $x = Ai + f$ where x is $N \times 1$ vector measuring total output and f is $N \times 1$ vector measuring final demand.
- The Leontief inverse, $B = I + A + A^2 + A^3 + ... = [I - A]^{-1}$, measures the long-term influences of one industry on other industries.
- The Multiplier Product Matrix (MPM) summarizes the interindustrial linkages: $MPM = \frac{1}{V} \parallel b_{i\cdot} \cdot b_{\cdot j} \parallel$, where $V = \sum_i \sum_j b_{ij}$

Manufacturing is still the most influential sector

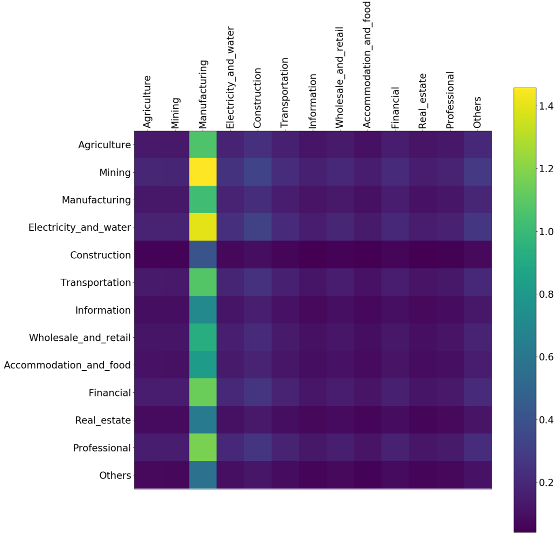


Figure: Multiplier Product Matrix (MPM) for 2012

But the importance of manufacturing is declining while dependence on financial and real estate sectors is rising

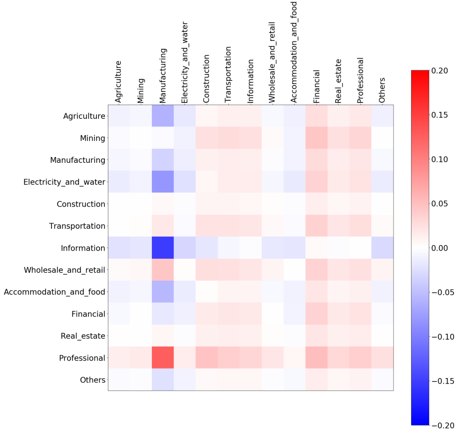


Figure: The heatmap shows $MPM_{2012} - MPM_{2007}$

...this contrasts with changes in the previous five years

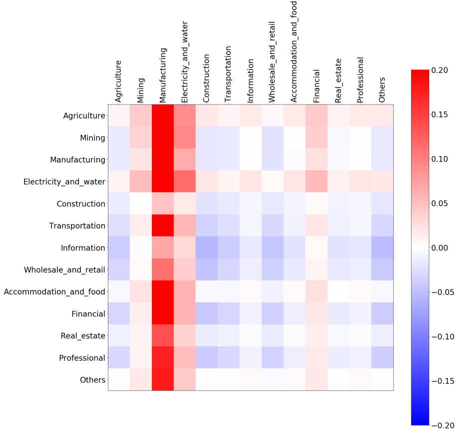
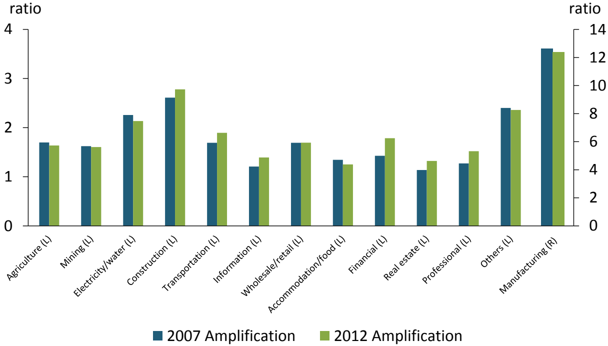


Figure: The heatmap shows $MPM_{2007} - MPM_{2002}$

Quantifying the amplification effects



- Each bar shows the percent of extra increase associated with 1 unit of increase in the final demand in a given sector.
- A 10% drop in real estate sector final demand leads to a 0.23% decline in total output in 2012, up from 0.14% in 2007.

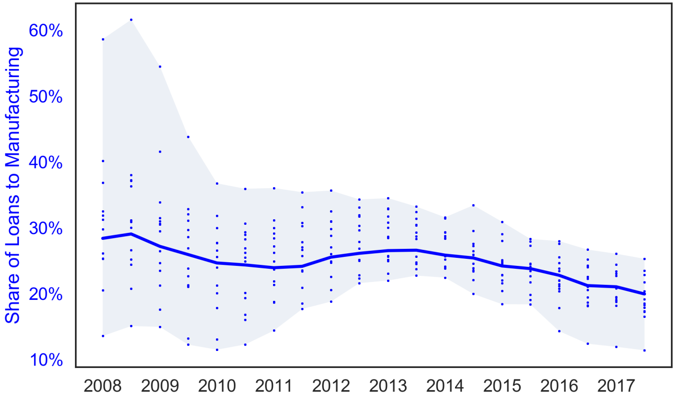
Short Summary on the I-O Table Analysis

- China has experienced a structural change in intersector linkages in the 2000s
  - Before 2007, the influence of manufacturing was rising while the influence of real estate was declining
  - After 2007, the influence of financial and real estate sectors increased while manufacturing's influence fell
- The influence of the real estate sector on other sectors has increased significantly, but in absolute size, it remains limited.

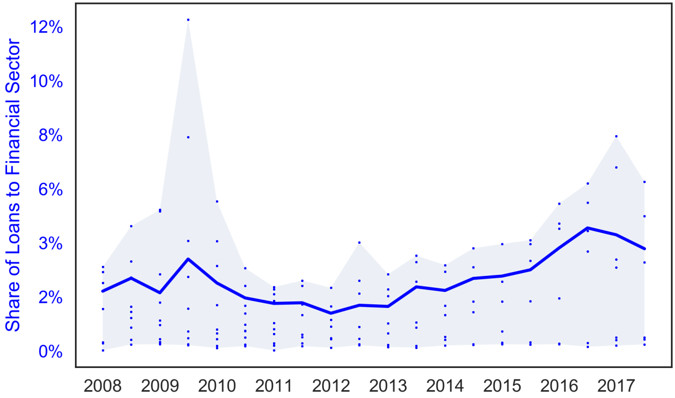
China's Real Estate Sector and the Banking System

- We focus on two questions:
  - How is the change in the distribution of bank loans across sectors associated with the housing boom in China?
  - Any potential risks associated with the above change?
- We examine the distribution of loans in different sectors
- We focus on listed banks in China

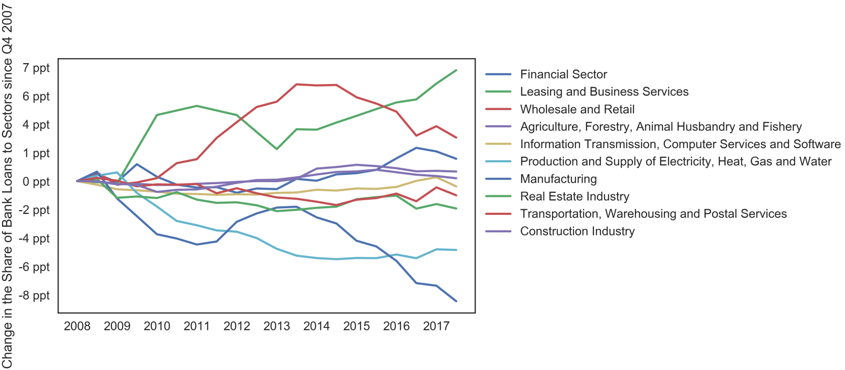
Manufacturing sector: a declining share of bank loans



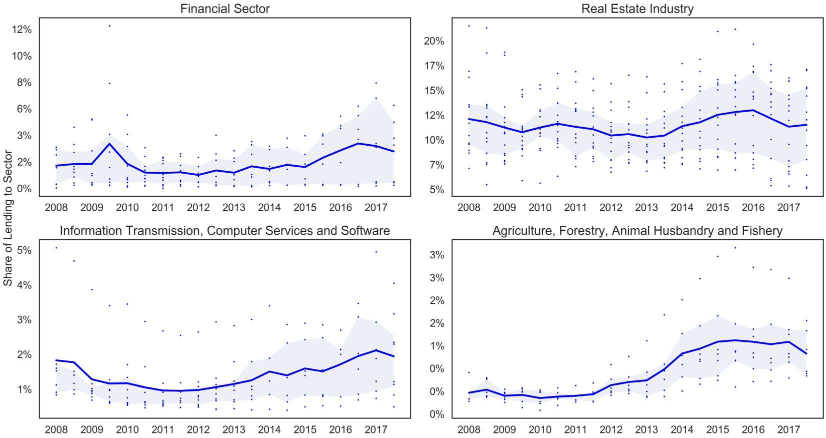
Financial sector: a rising share of bank loans



An Overview of the Changing Distribution



A Snapshot of Loan *Dispersions*



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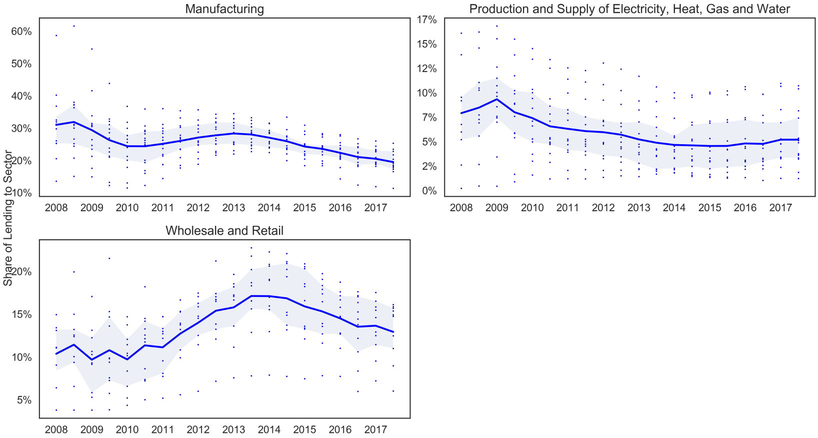
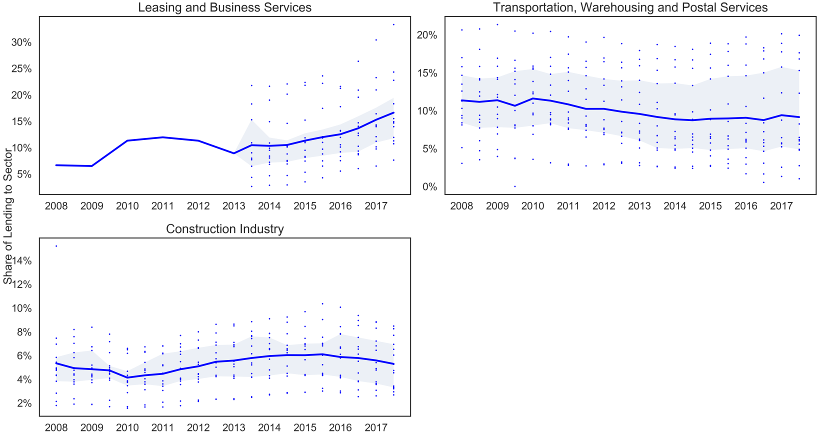


A Snapshot of Loan *Dispersions*



Brief Summary on the Bank-Loan Analysis

- Bank loans are shifting from manufacturing, supply and production of electricity, heat and water to financial and business services.
- Dispersion of loans across banks has increased in most sectors, including the financial sector and the real estate sector.

Final Thoughts

- The influences of the real estate sector on total output has increased, but remains limited compared to other sectors.
- Bank loans are shifting toward financial and business services.
- From the perspective of dispersion of loans, risks have increased as the dispersion is rising in most sectors.
- More research needs to be done to better understand the importance of the real estate sector on bank and non-bank loans, households' consumption and investment, as well as local governments' fiscal budgets.