Collateral Crises

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Motivation

- Information is at the heart of financial intermediation.
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- Transparency is at the heart of new proposed regulation.
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- Information is at the heart of financial intermediation.
- Transparency is at the heart of new proposed regulation.
- How information production shapes business cycles and financial crises?
- Should policies induce transparency?
Our Preliminary Answers

- In a world of collateralized short-term debt, information production about the quality of collateral may not be optimal.
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- Opacity makes it hard to distinguish good from bad collateral.
  - **Benefits:** "Ignorance Credit Boom": Firms with bad collateral get loans that they otherwise would not.
  - **Costs:** "Fragility": Firms with good collateral suffer from small shocks and do not get loans that they otherwise would.
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- Larger "ignorance credit booms", larger crises. **Endogenous tail events**
- After crises, recoveries are faster if
  - Without expansionary policies, information is replenished.
  - With expansionary policies, information is NOT replenished.
Some lose evidence

- Jorda, Schularick, Taylor (2011) study 14 developed countries over 140 years (1870-2008)
  - "Our overall result is that credit growth emerges as the single best predictor of financial instability…"
- More recently...
  - Credit boom since 1990s and large credit drop in 2008.
  - Small shock, sudden and large collapse.
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  - "Our overall result is that credit growth emerges as the single best predictor of financial instability…"
- More recently…
  - Credit boom since 1990s and large credit drop in 2008.
  - Small shock, sudden and large collapse.
- We test empirically our mechanism is at work behind these relations.
Related Literature

- Financial Intermediation.
  - **Reallocation of funds**: Diamond (85), Boyd and Prescott (86).
  - **Provision of trading securities**: Diamond and Dybvig (83), Gorton and Pennacchi (90), Dang et al (11).

- Macroeconomics and Crises
  - **Magnification and Persistence**: Bernanke, Gertler and Gilchrist (96), Kiyotaki and Moore (97), Krishnamurthy (09)
  - **Fragility**: Diamond and Dybvig (83), Allen and Gale (04), Ordonez (10).
  - **Leverage Cycles**: Geanakoplos (97 and 09).
  - **Information and Asymmetric Cycles**: Veldkamp (06), Ordonez (10).
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  We provide a theory of fragility, magnification, persistence and asymmetry of cycles, purely driven by information dynamics.
Goods, Information and Agents

- Two goods that can be used to consume or to produce.
  - **Numeraire** ($K$): Perishable and reproducible.
  - **Land** ($X$): Non-perishable and non-reproducible.
Goods, Information and Agents

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  - **Numeraire** ($K$): Perishable and reproducible.
  - **Land** ($X$): Non-perishable and non-reproducible.
    - **Good land**: Generates $C$ units of numeraire (only once).
    - **Bad land**: Generates 0 units of numeraire (only once).
  - Mass 1 of land. A fraction $\hat{p}$ is good.
  - **Symmetric perception** $p_i$ that a unit of land $i$ is good.
  - Whether a unit of land is good or bad can be observed at the beginning of the period at a cost $\gamma$ (in terms of $K$).
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- Two overlapping generations every period.
  - **Households**: Endowment of $K$ and no projects. ("young")
  - **Firms**: Projects but not enough endowment of $K$. ("old")
Firms

- Mass 1 of risk neutral individuals ("old" generation).
- They born with $L^*$ (no disutility), but no $K$.
- Production function of numeraire.

\[
Y = \begin{cases} 
A \min\{K, L\} & \text{with prob. } q \\
0 & \text{with prob. } (1-q) 
\end{cases}
\]

- Production is efficient ($qA > 1$). Optimal $K^* = L^*$. 
Households

- Mass 1 of risk-neutral individuals ("young" generation).
- They born with endowment of numeraire $\bar{K} > K^*$, but no $L^*$.
- They can lend $K$ to firms and buy land $X$ from firms.
Markets for land and loans

- **Land is traded at the end of the period**
  - If the buyer has all the negotiation power, the land price is $pC$.

- **Loans are traded at the beginning of the period.**
  - The output of firms is non-contractible.
  - Firms can post a fraction $x$ of land as collateral.
  - Assume lenders break even and $C > K^*$. 

Aggregate Consumption

- Consumption at period $t$ of
  - A household lending to firm $p$ and buying a land $p$.
    \[ \bar{K} - K(p) + E(\text{repay}|p) - pC \]
  - A firm with land $p$.
    \[ E(Y|p) - E(\text{repay}|p) + pC \]
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    \[E(Y|p) - E(repay|p) + pC\]
  - Aggregate consumption at period $t$ is.
    \[W_t = \bar{K} + \int_0^1 [E(Y|p) - K(p)]f(p)dp\]
Aggregate Consumption

- Consumption at period $t$ of
  - A household lending to firm $p$ and buying a land $p$.

$$\overline{K} - K(p) + E(repay|p) - pC$$

- A firm with land $p$.

$$E(Y|p) - E(repay|p) + pC$$

- First Best aggregate consumption.

$$W^* = \overline{K} + K^*(qA - 1)$$
Information Sensitive Debt

- Firms and lenders learn the true value of collateral.
- Lenders break even and debt is risk free

\[ p(qR_{IS} + (1 - q)xC) = \gamma + pK \quad \text{and} \quad R_{IS} =xC \]

Then

\[ x = \frac{pK + \gamma}{pC} \]
Information Sensitive Debt - Profits

\[ E(\pi|p, IS) \]

\[ pK^*(qA - 1) - \gamma \]

\[ p_L^I = \frac{\gamma}{K^*(qA - 1)} \]
Information Insensitive Debt

- Nor Firms nor lenders know the true value of collateral.
- Lenders break even and debt is risk free

\[ qR_{II} + (1 - q)pxC = K \quad \text{and} \quad R_{II} = pxC \]

Then \( x = \frac{K}{pC} \)

- Loans do not trigger information acquisition if,

\[ p[qR_{II} + (1 - q)xC - K] \leq \gamma. \]
Information Insensitive Debt

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\[ qR_{II} + (1 - q)pXC = K \quad \text{and} \quad R_{II} = pXC \]

Then \[ x = \frac{K}{pC} \]

- Loans do not trigger information acquisition if,

\[ K \leq \frac{\gamma}{(1 - p)(1 - q)}. \]
Information Insensitive Debt - Profits

\[ p_H = 1 - \gamma K^*(1 - q) \]

\[ p_L = \frac{1}{2} - \sqrt{\frac{1}{4} - \frac{\gamma}{c(1-q)}} \]

\[ E(\pi|p, II) = \frac{\gamma}{(1 - p)(1 - q)}(qA - 1) \]

\[ pC(qA - 1) \]

\[ K^*(qA - 1) \]
Information Insensitive Debt - Profits
Higher $\gamma$ implies less information production
Aggregate Consumption

\[ W_t = \bar{K} + \int_0^1 K(p)(qA - 1)f(p)dp, \]
Aggregate Consumption

- Now we will study the evolution of this distribution.
- The following analysis holds when types mean revert
Aggregate Consumption

- Now we will study the evolution of this distribution.
- The following analysis holds when types mean revert
- but let’s simplify the exposition
  - Every period, a fraction \((1 - \lambda)\) of land suffers an idiosyncratic shock and becomes good with prob. \(\hat{p}\).
  - The shock is observable. The realization is not.
Aggregate Consumption

\[ W_t = \bar{K} + [0f(0) + K(\hat{p})f(\hat{p}) + K^* f(1)](qA - 1), \]
Aggregate Consumption - Information Sensitiveness

\[ W_t^{IS} = \bar{K} + [(1 - \lambda)K(\hat{p}) + \lambda\hat{p}K^*](qA - 1) \]
Aggregate Consumption - Information Sensitiveness

$$W_t^{IS} = \bar{K} + \hat{p} K^* (qA - 1) - (1 - \lambda) \gamma < W^*$$
Aggregate Consumption - Information Insensitiveness

\[ W_t^{ll} = \bar{K} + [(1 - \lambda)K(\hat{p}) + \lambda\hat{p}K^*](qA - 1) \]
Aggregate Consumption - Information Insensitiveness

\[ W_t''' = \bar{K} + [(1 - \lambda^2)K(\hat{p}) + \lambda^2\hat{p}K^*] (qA - 1) \]
Aggregate Consumption - Information Insensitiveness

\[ W_t^{II} = \tilde{K} + (1 - \lambda^t (1 - \hat{p})) K^* (qA - 1) \to W^* \]
Aggregate Shocks to Collateral
Aggregate Shocks to Collateral
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Numerical Simulations: Profits and Cutoffs

![Graph showing the expected profits and cutoffs.](image-url)
Numerical Simulations: Average Quality of Collateral

\[ \eta = 0.97 \]
\[ \eta = 0.91 \]
\[ \eta = 0.90 \]
Numerical Simulations: Aggregate Consumption

Always produce information about idiosyncratic shocks.
Numerical Simulations: Aggregate Consumption

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Numerical Simulations: Standard Deviation of Beliefs

\[
\eta = 0.97
\]

\[
\eta = 0.91
\]

\[
\eta = 0.90
\]
A Planner

- Assume a planner that maximizes the discounted utility of cohorts

\[ U_t = E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} W_t. \]

- Optimal range of information production is wider.

- The planner can implement the optimum by subsidizing a fraction \( \beta \lambda \) of the information cost \( \gamma \).
A Planner: Cutoffs

\[ V_{IS} \]

effective monitoring cost = \( \gamma (1 - \beta \lambda) \)
Preventive Policies

- The possibility of a negative aggregate shock **does not always justify acquiring information**, reducing current output to insure against potential reductions in future output.
Preventive Policies

- The possibility of a negative aggregate shock does not always justify acquiring information, reducing current output to insure against potential reductions in future output.

- Under certain conditions (guaranteed if $\eta > \hat{\rho}$), incentives to acquire information increase with
  - The likelihood of the expected shock.
  - The size of the expected shock.
Ex-post Policies

- **Collateral Policies:**
  - Restore $\hat{p}$. *e.g.*, buy and guarantee collateral.
  - More effective when information is not produced.

- **Lending Policies:**
  - Avoid information acquisition. *e.g.*, subsidizing firm loans.
  - More effective in the presence of collateral policies.
Collateral Policies with Information

\[ \eta = 0.97 \]

\[ \eta = 0.90 \]

\[ \eta = 0.91 \]

Always produce information about idiosyncratic shocks
Collateral Policies without Information

Always produce information about idiosyncratic shocks

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\[ \eta = 0.97 \]

\[ \eta = 0.91 \]
Endogenous Security Structure

- Complex securities arise endogenously to increase borrowing.

- Assume two firms, one with land $p_1 = 1$ and the other $p_2 = 0.7$.
  How to increase expected borrowing?

- Pooling.
  - No pooling: II for $p_1$, borrowing $K^*$. IS for $p_2$, borrowing $0.7K^*$.
  - Pooling: II for expected quality $\bar{p} = 0.85$, borrowing $2K(\bar{p}) > 1.7K^*$

- More complexity (higher $\gamma$).
  - A higher $\gamma$ that moves $p_H \leq 0.85$ implies total borrowing of $2K^*$. 
A Real Source of a Credit Crunch

- A reduction in the success probability $q$ can lead to a credit crunch.
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$$\hat{p} = 1 - \frac{\gamma}{K^*(1-q)}$$

$$p^H = 1 - \frac{\gamma}{K^*(1-q)}$$

$$pK^*(qA - 1) - \gamma$$

$$\frac{\gamma}{(1-q)(1-p)}(qA - 1)$$
Final Remarks

- Information insensitive debt may be socially desirable, but it is vulnerable to a sudden loss of confidence in its insensitiveness.

- Macroeconomic implications:
  - Longer and larger "ignorance credit booms" generate more fragility and larger crises.
  - Recoveries.
    - NO expansionary policies: Information speeds up recoveries.
    - Expansionary policies: Information delays recoveries.

- Dispersion of beliefs (and of credit and production) is endogenous.
  We tested this implication of the mechanism empirically.
Extensions

- Endogenous complex securities.

- Crises without shocks, just decreasing marginal productivity.

- Optimal information production when collateral is productive?