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**Discussion of „Financial Fragility, Heterogeneous Firms  
and the Cross-Section of the Business Cycle“  
by Sean Holly and Emiliano Santoro**

# Financial Fragility, Heterogeneous Firms and the Cross-Section of the Business Cycle

By Sean Holly and Emiliano Santoro

Discussion by  
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# Summary I

- The paper analyzes the implications of firm heterogeneity for the business cycle:
  - Stylized facts and distributions
  - Theoretical model focusing on (i) credit market frictions, (ii) strategic interactions on the product market, (iii) micro-macro linkages
  - Calibration and regression-based analysis
- Main findings:
  - Decline in net worth has negative impact on capital stock and output.
  - Non-linearities matter.
  - Negative correlation between GDP growth and skewness in actual and simulated data.

# Summary II

- Firms:
  - Monopolistic (Bertrand) competition
  - Heterogeneity: revenue shocks lead to differences in financial status
  - Bankruptcy risk
- Banks:
  - Banks follow mark-up pricing rule with idiosyncratic and aggregated component.
  - Source of uncertainty:
    - Firm-specific, idiosyncratic shock to revenues
    - Aggregate productivity shock
- Central Bank:
  - Taylor rule based on aggregated data

# Timing

- **t-1:**
  - Retained profits determine net worth.
  - End-of-period leverage determines probability of bankruptcy.
- **t:**
  - Firm-specific shock is realized.
  - Firms enter and raise capital, interest rates are negotiated.
  - Production starts.
  - Firm set prices based on income and aggregate price index *without* prior information on competitors' prices.
  - Goods are sold.
  - Loans are repaid.

# Overall Assessment

- Comprehensive and challenging paper that contributes to an important research agenda: understanding implications of micro-behavior for aggregate outcomes.
  - Fits nicely into theme of conference.
- Novel approach of linking theoretical and empirical work.
- Model shows that financial frictions, firm heterogeneity, and strategic interactions are important for aggregated outcomes.

# Comments & Suggestions

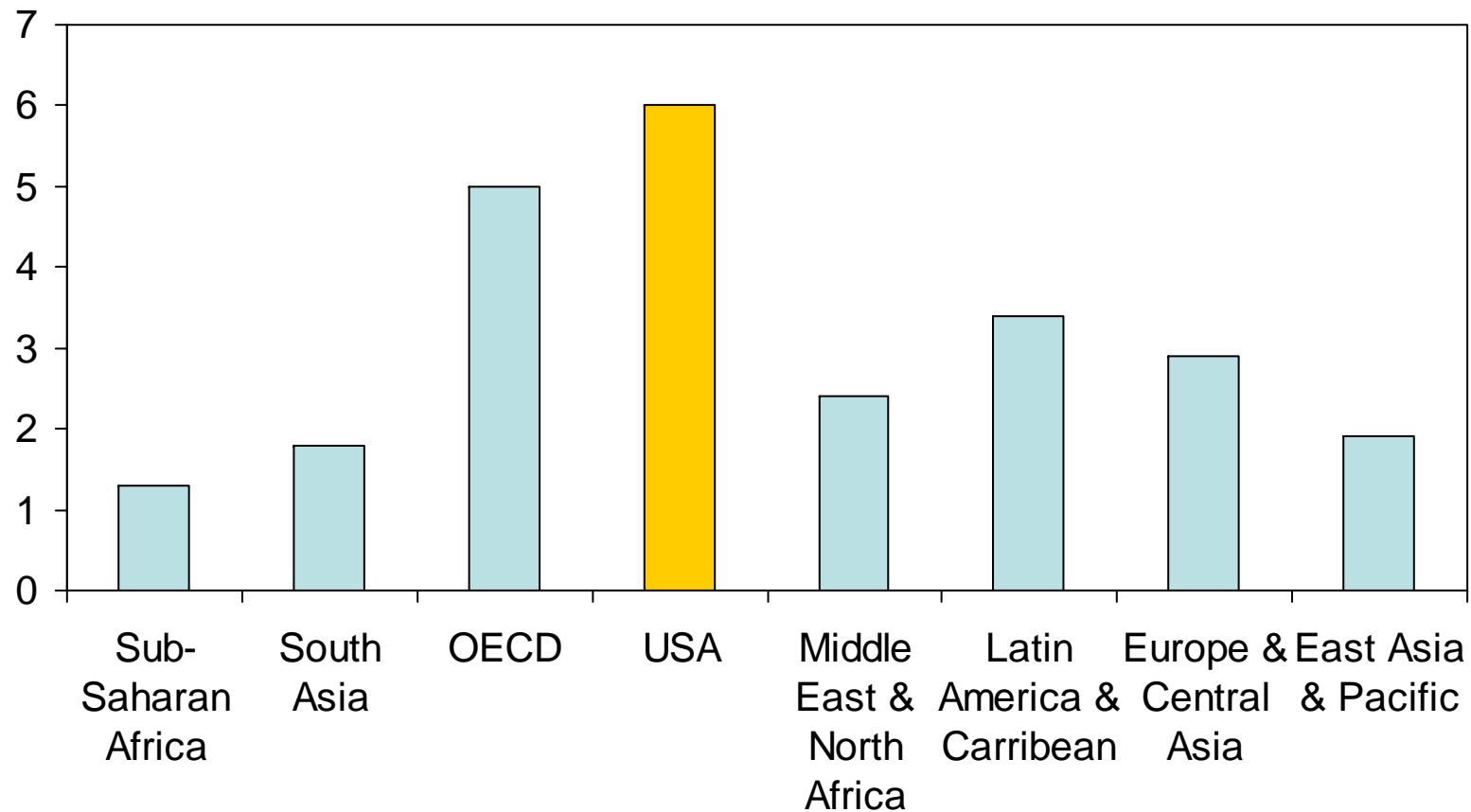
- Theoretical model
  - Sources of heterogeneity
  - Role of entry and exit
  - Role of information
  - Structure of credit markets
- Empirical implications
  - Calibration
  - Identification through heterogeneity
  - Time series and cross-country evidence
- Policy implications

# Sources of Heterogeneity

- Paper stresses idiosyncratic shocks to revenues as a source of heterogeneity.
  - Other sources of heterogeneity are conceivable as well:
    - Productivity shocks
    - Labor market frictions
    - Heterogeneous banks
    - Access to outside equity finance
    - International exposure
  - These can be expected to differ across industries and countries.
- Motivate the particular choice of heterogeneity more carefully.

# How important are cross-country differences in credit market frictions?

## Credit Information Index



Source: World Bank

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# Role of entry and exit

- Davis et al. (1996): entry and exit of firms are as important as dynamics of incumbents
  - Holly and Santoro (2007): “..., *financial fragility affects exit and entry of firms because of explicit risk of bankruptcy.*” (p. 3)
  - But: Entry does not involve fixed costs in the model, and firms leaving the market are replaced immediately by new entrants (p. 16).
- Doesn't this rule out important dynamics?

# Role of information

- Firms cannot observe pricing strategy of their competitors and have to use simple, static rule.
- Banks can base their mark-up pricing rule on (observed) bankruptcy risk.
- Does this imply that *past* realizations are common knowledge while *current* shocks cannot be observed by others?
- Do the information sets of firms, commercial banks, and the Central Bank differ?

# Structure of the credit market

- Representative bank uses mark-up function depending on
  - firm-specific probability of default and
  - aggregate rate of default in the previous period.
- Can this pricing rule be derived from an explicit optimization of the bank?
- Are firm-specific probability of default and aggregate default rate separable?

# Empirical Implications: Calibration

- Empirical strategy in the paper based on calibration and regression of GDP on calibrated moments
    - Testing similarity between distributions in actual and simulated data could be interesting as well.
  - Which features of the model drive the results?
    - Financial frictions? Strategic interaction?
    - Haltiwanger (1997): “... *model dependence is apt to be a generic issue in considering the link between micro and macro behavior.*” (p. 73)
- Provide sensitivity checks for different versions of the model

# Empirical Implications: Identification through Heterogeneity?

- Gilchrist and Zakrausek (1995):
  - Credit channel be identified only through firm-level evidence.
  - Financial frictions are more important for different classes of agents, borrowers, and sectors.
- Paper stresses heterogeneity but looks at aggregated moments.
- Structural implications of the Holly-Santoro model could be taken to firm-level data.

# Empirical Implications: Cross-Country versus Time Series

- Credit market frictions affect the link between firm-level and aggregate volatility.
  - How does the link between firm-level and aggregated developments evolve over time? (cf. debate on the ‘Great Moderation’)
  - Can the model explain differences in aggregate volatility across countries?
- Globalization might affect micro-macro linkages
  - Financial market development *versus*
  - Changes in size patterns of firms

# Policy Implications

- Changes in monetary policy conditions affect commercial banks' interest rates and firm dynamics.
- Are the implications for monetary policy similar to, for instance, those of credit channel models?
- Is the Taylor rule based on aggregated developments optimal?
  - Or can Central Banks infer information from distributional dynamics of firms?

# Trivia

- Table 2.1:  $p$ - or  $t$ -values?
- p. 11: Is the distinction between rate of return on net worth (dividends) and loan rate meaningful?

- (3.10) and (3.11) imply: 
$$l_{i,t} = \frac{L_{i,t}}{A_{i,t}} = \frac{PB_{i,t-1}}{1 - PB_{i,t-1}}$$