WHAT DETERMINES BANKS’ MARKET POWER?

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Relationship banking and borrower lock-in due to asymmetric information

- Banks obtain gradually private information about their own new young borrowing firms. Gives rise to information monopoly, borrowers get informationally locked in and banks earn extra rent from these borrowers. The inside bank of a firm.

- The rent is competed away initially when banks try to capture young borrowers to earn future rents. (See theoretical literature: Sharpe (1990), Rajan (1992), von Thadden (2004)).
Zero expected profit interest rate

Markup
Definitions:

- Zero expected profit interest rate = the interest rate that gives the bank 0 expected profits on a loan.

- Interest rate markup = Actual interest rate on a loan—zero expected profit interest rate.
• Lock-in and bank competition; two theories:

  – The extent of lock-in is determined by lack of competition due to *severeness of asymmetric information*; theory model of this paper. (Akerlof).

  – The extent of lock-in is determined by lack of competition due to *bank market structure*, i.e. number of banks, market concentration; Petersen and Rajan (1995). (Herfindahl).
Contribution of this paper

- A three stage theory model of lock-in
  - shows how lock-in is resolved in stage 3

- Empirically test to what extent lock-in is determined by asymmetric information and/or concentration in the credit market.

- Focus on small unlisted firms. Less publicly available information about such firms.
Severeness of asymmetric information

- A theory model on how the interest rate markup will evolve over a firm’s age depending on asymmetric information:
  - At first negative markup
  - Then increasing markup due to winner’s curse
  - As firms get older, information more dispersed, more competition \( \Rightarrow \) markup falls.
Empirically testable predictions from the information based theory model (Akerlof):

I The interest rate markup follows a life cycle pattern over the firm’s age: young firms pay a low or negative markup, thereafter the markup increases until it falls for old firms.

II The life cycle pattern described in I is more pronounced for more opaque firms, i.e. firms with more severe asymmetric information problems.

III More opaque firms have their lock-in resolved at a higher age.
Interest rate markup for the three different age groups. The qualitative effects from more severe asymmetric information problems, is illustrated by the vertical arrows.
Market structure (Herfindahl) hypothesis:

**IV** Petersen and Rajan (1995): Less competitive, i.e., more concentrated credit market ⇒ banks can obtain more rent from informationally locked-in firms in the second period ⇒ *more* lock-in of borrowers but lower interest rate markup for young borrowers.
Empirical model and data

• Use publicly available data on annual income and balance sheet for a large sample of relatively small* unlisted non-financial Norwegian limited liability firms from 2000 and 2001. 47,993 observations.

• A model based on these data predicting the bankruptcy probability for each firm, SEBRA.

• We apply the predicted bankruptcy probabilities of SEBRA as data in our empirical model.

*Operating income < NOK 100 millions or appr. EUR 12 millions.
Empirical model

• We see how the interest rate mark up evolves over a firm’s lifespan.

• Simultaneously test the *severeness of asymmetric information* hypotheses of our theory model and the *market structure* hypothesis.

\[ m_{i,t} = (AINFO_{c,k}, d_{AGE; i,t}, conc_{c,t}, \epsilon_{i,t}) \]

- \( m_{i,t} \) = interest rate markup
- \( AINFO_{c,k} \) = measure of the severeness of asymmetric information
- \( d_{AGE; i,t} \) = dummy for firm age group
- \( conc_{c,t} \) = measure of bank credit market concentration
Empirical model, the variables

- $m_{i,t}$ is calculated as the actual interest rate paid minus the zero expected profit interest rate for firm $i$ in year $t$.
  - Actual interest rate is calculated using firms’ income statements and balance sheets.†
  - zero expected profit interest rate calculated using predicted bankruptcy probabilities $p_{i,t}$ from SEBRA.‡

†Exclude firms with pathological values of interest rate. Large changes in lending at the end or beginning of the year.
‡We use a ratio of loss given bankruptcy of 0.6, but check for robustness.
• As a proxy for the severity of the ex ante asymmetric information problem in lending to a firm within a particular group of firms, we use $V L_{c,k}$, which is the volatility of the bankruptcy probability for all firms in industry sector $k$ in county $c$. A measure of how reliable is the publicly available information regarding a firm’s credit worthiness. Indicates how important is the soft information about firms.

• We divide firms into five age classes 1–10, 11–20, 21–30, 31–40, and above 40 years.

• To measure the concentration in the market of bank loans to all domestic non-financial business borrowers, we use the Herfindahl index for county $c$ in year $t$. 
<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Coefficient</th>
<th>Robust t-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_0$</td>
<td>0.05581</td>
<td>17.62**</td>
</tr>
<tr>
<td>$d_{1;i,t}$</td>
<td>0.00604</td>
<td>2.39**</td>
</tr>
<tr>
<td>$d_{2;i,t}$</td>
<td>0.00613</td>
<td>1.46</td>
</tr>
<tr>
<td>$d_{3;i,t}$</td>
<td>0.00591</td>
<td>1.00</td>
</tr>
<tr>
<td>$d_{4;i,t}$</td>
<td>-0.01303</td>
<td>-2.08**</td>
</tr>
<tr>
<td>$VL_{c,k}$</td>
<td>-0.28807</td>
<td>-7.35**</td>
</tr>
<tr>
<td>$VL_{c,k} \cdot d_{1;i,t}$</td>
<td>0.38169</td>
<td>6.59**</td>
</tr>
<tr>
<td>$VL_{c,k} \cdot d_{2;i,t}$</td>
<td>0.56255</td>
<td>4.55**</td>
</tr>
<tr>
<td>$VL_{c,k} \cdot d_{3;i,t}$</td>
<td>0.57427</td>
<td>3.86**</td>
</tr>
<tr>
<td>$VL_{c,k} \cdot d_{4;i,t}$</td>
<td>0.72027</td>
<td>5.12**</td>
</tr>
<tr>
<td>$HI_{c,t}$</td>
<td>$-2.76 \cdot 10^{-7}$</td>
<td>-0.16</td>
</tr>
<tr>
<td>$HI_{c,t} \cdot d_{1;i,t}$</td>
<td>$-1.15 \cdot 10^{-6}$</td>
<td>-0.83</td>
</tr>
<tr>
<td>$HI_{c,t} \cdot d_{2;i,t}$</td>
<td>$-1.40 \cdot 10^{-6}$</td>
<td>-0.61</td>
</tr>
<tr>
<td>$HI_{c,t} \cdot d_{3;i,t}$</td>
<td>$-7.83 \cdot 10^{-7}$</td>
<td>-0.23</td>
</tr>
<tr>
<td>$HI_{c,t} \cdot d_{4;i,t}$</td>
<td>$7.32 \cdot 10^{-6}$</td>
<td>1.78*</td>
</tr>
<tr>
<td>coll$_{i,t-1}$</td>
<td>-0.01697</td>
<td>-26.13**</td>
</tr>
<tr>
<td>bankdebt$_t$</td>
<td>$-3.74 \cdot 10^{-7}$</td>
<td>-2.95**</td>
</tr>
<tr>
<td>$p_{i,t}$</td>
<td>-0.38949</td>
<td>-26.10**</td>
</tr>
</tbody>
</table>

$F$-test for $HI_{c,t}$ terms: 1.10, 0.38

$\text{corr}(age_{i,t}, \hat{e}_{i,t})$ 0.0167

# clusters: 36

# observations: 47993

$R^2_{\text{adj}}$: 0.1338
• The terms containing the bank market concentration measure are not significant. No support for Hypothesis IV: Petersen and Rajan’s theory of higher market concentration and thus higher markup for locked-in borrowers.
Test of Hypothesis I–III: Severeness of asymmetric information determines the life cycle pattern of interest rate markups:

- From the estimated equation and variance-covariance matrix we predict the expected values and standard errors of the markups for firms in different age groups and with different values of the metric for the severeness of asymmetric information, \( V L_{c,k} \). Holding \( H_{c,t} \) and the control variables at their sample mean value.
### Predicted markups

<table>
<thead>
<tr>
<th>Volatility frac-tiles</th>
<th>1–10</th>
<th>11–20</th>
<th>21–30</th>
<th>31–40</th>
<th>Above 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 pct.</td>
<td>0.0440 (0.0010)</td>
<td>**0.0492 (0.0014)</td>
<td>→ 0.0493 (0.0013)</td>
<td>→ 0.0500 (0.0014)</td>
<td>**0.0433 (0.0012)</td>
</tr>
<tr>
<td>25 pct.</td>
<td>0.0437 (0.0010)</td>
<td>**0.0493 (0.0014)</td>
<td>→ 0.0496 (0.0013)</td>
<td>→ 0.0503 (0.0014)</td>
<td>**0.0438 (0.0012)</td>
</tr>
<tr>
<td>50 pct.</td>
<td>0.0420 (0.0010)</td>
<td>**0.0498 (0.0015)</td>
<td>→ 0.0511 (0.0011)</td>
<td>→ 0.0519 (0.0013)</td>
<td>**0.0463 (0.0012)</td>
</tr>
<tr>
<td>75 pct.</td>
<td>0.0399 (0.0011)</td>
<td>**0.0505 (0.0016)</td>
<td>→** 0.0532 (0.0014)</td>
<td>→ 0.0541 (0.0018)</td>
<td>* 0.0495 (0.0020)</td>
</tr>
<tr>
<td>95 pct.</td>
<td>0.0337 (0.0016)</td>
<td>**0.0525 (0.0023)</td>
<td>* 0.0591 (0.0033)</td>
<td>→ 0.0602 (0.0043)</td>
<td>→ 0.0588 (0.0050)</td>
</tr>
</tbody>
</table>
• Support for Hypothesis I: Markup follows the predicted life cycle.

• Hypothesis II: The more opaque firms are, the lower markup they pay when they are young and the higher markup they pay when middle aged and locked-in.

• Support for Hypothesis III: Firms with more asymmetric information problems have their lock-in resolved at a higher age.
Conclusions

• The extent of lock-in and thus market power in credit markets for small unlisted firms is not determined by the concentration of banks in the credit market, á la Petersen and Rajan.

• The asymmetric information problems that may give rise to informational advantage for inside banks seem to be more important in determining lock-in and banks’ market power in lending to small firms.