Deposit Supply and Loan Demand in a Bank Sector with Differentiated Competition between Investor- and Customer-Owned Banks

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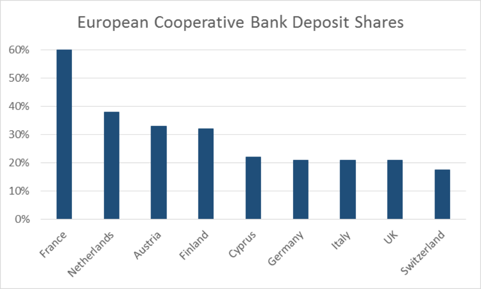
Introduction – Incidence of Customer-Owed Banks

- Savings banks are often owned by their customers (i.e. mutuals, cooperatives, credit unions, etc) rather than by investors



UK data from www.bsa.org.uk (2014), otherwise ICBA (2005)

Demutualisations of US Customer-Owed Banks

- In the US, many customer-owned (*CO*) savings banks have "demutualised" to become investor-owned (*IO*):

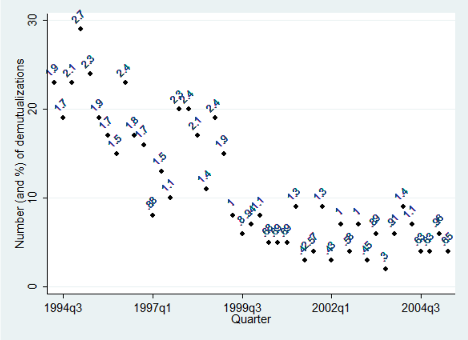


Figure 3 from Girotti and Meade (2017), Banque de France working paper.

Demutualisation Explanations

- Demutualisations have variously been explained in terms of:
  - *Capital access* – Hadaway and Hadaway (1981), Masulis (1987), Chaddad and Cook (2004):
    - *CO* banks restricted to relying on profits and retained earnings to fund growth, and buffer shocks;
  - *Regulation* – Kroszner and Strahan (1996):
    - Demutualisations as cheaper alternative to closing down insolvent thrifts for cash-strapped regulators; and
  - *Failure to maximise owners' welfare* – Girotti and Meade (2017).

Demutualisation due to Dissatisfaction?

- As to the latter explanation, support might be taken from the fact that *CO* savings banks, on average, have often offered *lower* deposit rates than *IO* savings banks:

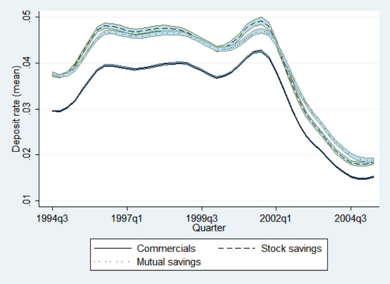


Figure 4 from Girotti and Meade (2017), Banque de France working paper.

Question

- Question – instead of demutualisations being a sign of *dissatisfaction* with how *CO* banks were operating, might the opposite be true:
  - Perhaps customer-owners were in fact so *satisfied* with their *CO* banks that they were prepared to accept lower deposit rates?
  - Hence, due to internal agency conflicts or otherwise, perhaps the banks that demutualised were the ones for which this effect was most pronounced – i.e. those which could raise deposits for loan making on the most favourable terms?

Contribution

- This paper sheds light on this question by developing a Hotelling-style model:
  - Of differentiated competition between duopolistic *CO* and *IO* banks, each taking deposits and making loans;
  - Based on first deriving what deposit supply and loan demand look like when households face such "mixed" competition; and
  - Showing that *CO* offers a lower deposit rate in equilibrium if it has sufficient "mass market" appeal.
- It contributes to a very sparse theoretical literature on mixed bank competition (e.g. Girotti and Meade (2014), Girotti et al. (2015)).

Setup – Household Deposit Supply Choice

- Adapt standard two period household inter-temporal utility maximisation problem to be in terms of deposit choice (vs consumption choice).
- Household's exogenous income is y_t in periods $t \in \{1,2\}$, while its consumption in each period is c_t.
- It makes a *fixed* deposit $D > 0$ in period 1, earning exogenous deposit rate r_i^D where $i \in \{CO, IO\}$.
- The household's budget constraints write in the usual way as:

$$c_1 = y_1 - D \quad (1)$$

$$c_2 = y_2 + D\left(1 + r_i^D\right) \quad (2)$$

Household Deposit Supply Choice (cont'd)

- Assuming time-invariant preferences, and common discount factor β, the household's *gross* utility thus writes as:

$$U(c_1) + \beta U(c_2) \quad \text{s.t. BCs (1) and (2)}$$

$$\Leftrightarrow \quad \underbrace{U(y_1 - D) + \beta U\left(y_2 + D\left(1 + r_i^D\right)\right)}_{\equiv U_i}$$

- Now introduce differentiation, and derive *net* utility attaching to the choice of which bank to deposit at ...

Adding Differentiation

- Suppose each bank type i offers households a differentiated bundle of non-deposit rate characteristics, and that households have preferences over those characteristics.
- Specifically, assume households:
  - Are uniformly distributed over the unit line, with CO exogenously located at a and IO exogenously located at $1-b$; and
  - Incur a quadratic "misalignment cost" (proportional to c) from being located at x rather than where their preferred bank type is located.
- Impose $a+b<1$ to ensure deposit supplies are upward sloping, and loan demands downward sloping.

Deposit Choice with Differentiation

- A household located at x thus faces the following *net* utility maximisation problem:

$$\max_{\{CO, IO\}} \left\{ U_{CO} - c\,(x-a)^2, U_{IO} - c\,(x-(1-b))^2 \right\}$$

$$U_i \equiv U\,(y_1 - D) + \beta\, U\left(y_2 + D\left(1 + r_i^D\right)\right), \quad i \in \{CO, IO\}$$

- Notice that $U\,(y_1 - D)$ and β are independent of bank type i, so the household deposits with CO iff:

$$U\left(y_2 + D\left(1 + r_{CO}^D\right)\right) - c\,(x-a)^2$$

$$> U\left(y_2 + D\left(1 + r_{IO}^D\right)\right) - c\,(x-(1-b))^2$$

Simplifying Deposit Choice Problem

- We can usefully simplify further if we assume U_i is:
  1. Quasi-linear in income; and
  2. Logarithmic in $D\left(1+r_i^D\right)$.
- In that case utility writes as:

$$U_i\left(r_i^D\right) = y_2 + ln(D) + ln\left(1+r_i^D\right) \approx y_2 + ln(D) + r_i^D$$

- Since y_2 and D are independent of bank type i, the only part of utility relevant to bank choice is r_i^D ...

Solution – Deposit Supply for Each Bank Type

- A household located at x therefore faces a much simpler problem:

$$\max_{\{CO, IO\}} \left\{ r_{CO}^{D} - c\left(x-a\right)^{2}, r_{IO}^{D} - c\left(x-\left(1-b\right)\right)^{2} \right\}$$

- Solving for the indifferent household's location in the usual way:

$$\hat{x}\left(r_{CO}^{D}, r_{IO}^{D}\right) = \frac{r_{CO}^{D} - r_{IO}^{D}}{2c\left(1-a-b\right)} + \frac{1}{2}\left(1+a-b\right)$$

- Assuming a unit mass of households, the deposit demand facing each bank type is therefore:

$$q_{CO}^{D}\left(r_{CO}^{D}, r_{IO}^{D}\right) = \hat{x}\left(r_{CO}^{D}, r_{IO}^{D}\right)$$

$$q_{IO}^{D}\left(r_{CO}^{D}, r_{IO}^{D}\right) = 1 - \hat{x}\left(r_{CO}^{D}, r_{IO}^{D}\right)$$

Setup – Household Loan Demand Choice

- Suppose our (other) unit mass of households also chooses fixed loan demand amount $L > 0$.
- Following the steps above, the household's gross utility from borrowing is:

$$U_i^L \equiv U(y_1 + L) + \beta U\left(y_2 - L\left(1 + r_i^L\right)\right)$$

- Allowing our CO and IO banks to also offer differentiated loan bundles, and assuming household "misalignment costs" as before, the loan choice problem of a household located at x^L ultimately simplifies as:

$$\max_{\{CO, IO\}} \left\{-r_{CO}^L - c^L\left(x^L - a\right)^2, -r_{IO}^L - c^L\left(x^L - (1-b)\right)^2\right\}$$

Solution – Loan Demand for Each Bank Type

- Proceeding as before, the indifferent household's location is given by:

$$\hat{x}^L\left(r^L_{CO}, r^L_{IO}\right) = \frac{r^L_{IO} - r^L_{CO}}{2c^L(1-a-b)} + \frac{1}{2}(1+a-b)$$

- So our loan demand for CO located at a, and for IO located at $(1-b)$, are:

$$q^L_{CO}\left(r^L_{CO}, r^L_{IO}\right) = \hat{x}^L\left(r^L_{CO}, r^L_{IO}\right)$$

$$q^L_{IO}\left(r^L_{CO}, r^L_{IO}\right) = 1 - \hat{x}^L\left(r^L_{CO}, r^L_{IO}\right)$$

Setup – Bank Objective Functions

- Each bank chooses its own deposit and lending rates, taking the deposit and lending rate choices of its rival as given.
- In general, this means $q_i^D \neq q_i^L$, but each bank can only lend funds it has:
  - Hence we also assume that each bank can borrow or lend on a wholesale market at exogenous rate r^W.
- Assuming quadratic variable costs, and writing $r^j \equiv \left(r^j_{CO}, r^j_{IO}\right)$ for $j \in \{D, L\}$, profit of bank i is:

$$\Pi_i\left(r^D, r^L\right) = r_i^L q_i^L\left(r^L\right) - r_i^D q_i^D\left(r^D\right) + \underbrace{r^W\left(q_i^D\left(r^D\right) - q_i^L\left(r^L\right)\right)}_{\text{wholesale balancing}}$$

$$- \frac{\gamma^L}{2} q_i^L\left(r^L\right)^2 - \frac{\gamma^D}{2} q_i^D\left(r^D\right)^2 - F_i$$

Bank Objective Functions (cont'd)

- While *IO* is assumed to choose its deposit and loan rates to maximise profits, *CO* is assumed to do so to maximise profits *plus depositor and borrower surpluses*.
- Bank objective functions can therefore be written as:

$$\Pi_i\left(r^D, r^L\right) + 1\left(CO\right)\left\{S^D_{CO}\left(r^D\right) + S^L_{CO}\left(r^L\right)\right\}$$

$$S^D_{CO}\left(r^D\right) = \int_0^{r^D_{CO}} q^D_{CO}\left(x, r^D_{IO}\right) dx$$

$$S^L_{CO}\left(r^L\right) = \int_0^{q^L_{CO}(r^L)} r^L_{CO}\left(x, r^L_{IO}\right) - r^L_{CO}\left(q^L_{CO}\left(r^L\right)\right) q^L_{CO}\left(r^L\right)$$

- Taking FOCs for each bank with respect to their own deposit and lending rates, given their rival's rates, and solving for equilibrium rates ...

Results – *CO* can Offer Lower Deposit Rate than *IO*

- Recall that *CO* formally seeks to maximise the equivalent of welfare (i.e. profits plus surpluses), while *IO* maximises just profits:
  - This might tempt one to believe that in equilibrium, $r^D_{CO} > r^D_{IO}$, and $r^L_{CO} < r^L_{IO}$;
  - But "misalignment cost" effects must also be taken into account ...
- Indeed, provided *CO* is located sufficiently closer to the mass of depositors than *IO* is, its equilibrium deposit rate is in fact *lower* than *IO*'s. Formally:

$$\hat{r}^D_{CO} < \hat{r}^D_{IO} \iff \frac{c}{\delta^D} < \frac{a-b}{(a-b-1)(a+b-1)}$$

- RHS denominator is positive, so condition is only satisfied if a is sufficiently greater than b.

CO can also Charge Higher Loan Rate than *IO*

- We find an analogous condition for when *CO* charges a *higher* equilibrium loan rate than *IO*, despite (actually, because of) it formally maximising consumer welfare:

$$\hat{r}^L_{CO} > \hat{r}^L_{IO} \iff \frac{c^L}{\delta^L} < \frac{a-b}{(a-b-1)(a+b-1)}$$

- Once again, provided *CO* has sufficient "mass market" appeal (i.e. a is sufficiently greater than b), *CO* maximises its customer welfare even though it sets a loan rate (and deposit rate) less favourable than those set by its profit-maximising rival.

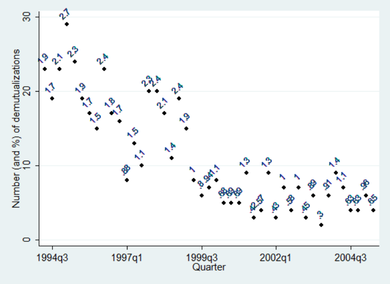
Discussion – Alternative Rationale for Demutualisation

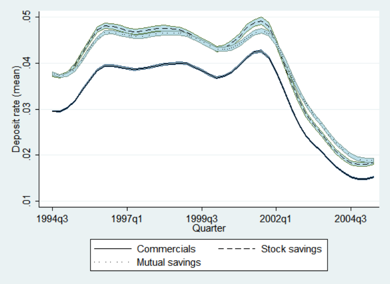
- These predictions provide an alternative explanation for why *CO* savings banks in the US offered lower deposit rates than *IO* banks up until when demutualisations petered out:
  - Girotti and Meade (2017) might be right – due to agency or other reasons, *CO* banks might not have been strictly maximising their customers' welfare, with low deposit rates (and high loan rates) a sign of governance failure;
  - However, this model suggests that these relative deposit and loan rates are also consistent with welfare-maximising behaviour.

Alternative Rationale for Demutualisation (cont'd)

- Under the latter interpretation, any governance failure may have instead been for bank managers demutualising to take advantage of the fact that *CO* banks could borrow and lend at seemingly favourable rates.
- One could imagine such a process beginning with those *CO* banks that had the most "mass market" appeal, and hence the strongest rates advantages:
  - That would leave only those *CO* banks with less such appeal, who on average had to set higher deposit rates and lower loan rates in order to remain competitive.

Alternative Rationale for Demutualisation (cont'd)





Further Work

- This model is very much "beta version", so will benefit from further development.
- In fact I developed it in an attempt to address a different question posed by the Girotti and Meade (2017) study:
  - How to justify our inclusion of "price" and ownership interactions in our empirical specification of indirect utility:

$$u_{ijt} = \alpha_i \left(y_i + r^D_{jt} l_i \right) + \alpha_i^{Sav} \left(r^D_{jt} l_i \times Sav_{jt} \right)$$

$$+ \alpha_i^{CustOwn} \left(r^D_{jt} l_i \times CustOwn_{jt} \right) + x_{jt}\beta_i + \xi_{jt} + \varepsilon_{ijt}$$

- In fact I don't think this model will help (due to the deposit choice simplifications imposed), so will likely instead further develop Meade (2019) to address this latter question.

Conclusions

- There is very little theoretical analysis of mixed bank competition, so this study helps to fill a gap:
  - Especially in its modelling of differentiated demand and competition.
- Clearly its implications for understanding demutualisations needs further work, in order to distinguish between diametrically opposite hypotheses:
  - Perhaps demutualisations are a sign of agency problems in either case;
  - But do they indicate customer *dissatisfaction* as a *response* to such problems, or customer *satisfaction* as their *cause*?
- Sounds like an excellent empirical question ...

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