Klein and Monti meet Weyl and Fabinger: Imperfect competition in the banking sector

by

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Abstract

The Monti-Klein model of monopolistic banking is extended by Weyl and Fabinger’s (2013) conduct parameter approach to include oligopolistic banking. By considering imperfect competition in loan and deposit markets, I show that whether an increase in the conduct parameter in one market also raises the equilibrium rate in the other market depends on whether the marginal cost of loan/deposit increases or decrease as the amount of the other “product” increases. Specifically, if the cross partial derivative of the cost function is positive, then an increase in the conduct parameter in the loan market lowers the deposit rate, whereas an increase in the conduct parameter in the deposit market raises the lending rate.

Keywords: Banking Industry; Imperfect Competition; Conduct Parameter Approach.
JEL classification: D43; G21; L13.

1 Introduction

In this note, I study the Monti-Klein model of monopolistic banking in the loan and the deposit markets (Klein 1971; Monti 1972; Dermine 1986; Gunji and Miyazaki 2019) by using Weyl and Fabinger’s (2013) conduct parameter approach to consider oligopolistic banking in both loan and deposit markets. Banks “produce” loan and deposit services for firms and consumers by incurring production cost. This is captured by the standard cost functions with two outputs. It is shown that the cross partial derivative of the cost function is key: if it is

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positive (resp. negative), then an increase in the conduct parameter in the loan market lowers (resp. raises) the deposit rate, whereas an increase in the conduct parameter in the deposit market raises (resp. lowers) the lending rate.

2 Model

I follow Freixas and Rocht’s (2008, Ch. 3) exposition of the Monti-Klein model. The demand for loans is described by $L(r_L)$, which is downward sloping, whereas the supply of deposits from households is given by an upward sloping function, $D(r_D)$. The banking industry as a whole provides deposit and loan services; its production technology is captured by a cost function $C(D, L)$, which satisfies the regularity conditions. Thus, the representative bank has the following profit function:

$$\pi(r_L, r_D) = (r_L - \bar{r})L(r_L) + [(1 - \alpha)\bar{r} - r_D]D(r_D) - C[D(r_D), L(r_L)],$$

where $\bar{r} \geq 0$ is the fixed rate on the interbank market, and $\alpha \in [0, 1)$ is the rate for compulsory reserves. To study the equilibrium pricing, consider a small increase in the lending rate, $r_L$. Then, imperfectly competitive banks recognize that they capture only $100 \times \theta_L$ percent of the profit gain by raising the lending rate, where $\theta_L \in [0, 1]$ is the conduct parameter for the lending market, measuring the degree of imperfect competition in lending, with $\theta_L = 1$ being monopoly and $\theta_L = 0$ being perfect competition. Let $\Delta r_L > 0$ and $\Delta L < 0$ be the increase in $r_L$ and the associate change in the amount of lending, respectively. Then, given the equilibrium deposit rate $r_D^*$ and the amount of deposits $D^*$, the bank equates the marginal profit gain and the loss from raising $r_L$ (see Figure 1):

$$\theta_L \Delta r_L + \frac{\partial C}{\partial L} \cdot (-\Delta L) = (r_L - \bar{r})(-\Delta L).$$

Similarly, given the equilibrium lending rate $r_L^*$ and the amount of loans $D^*$, the bank also equates the marginal gain and the marginal loss from lower the savings rate in the deposit market (see Figure 1):

$$\theta_D(-\Delta r_D) + \frac{\partial C}{\partial D} \cdot (-\Delta D) = [(1 - \alpha)\bar{r} - r_D](-\Delta D).$$

Then, formally, the equilibrium rates $(r_L^*, r_D^*)$ satisfy:

$$\frac{(r_L^* - \bar{r}) - \frac{\partial C}{\partial L}[D(r_D^*), L(r_L^*)]}{r_L^*} = \frac{\theta_L}{\epsilon_L(r_L^*)}.$$
Figure 1: Bank’s Pricing Incentives

\[ (1 - \alpha)\bar{r} - r^* - \frac{\partial C}{\partial D}(D(r^*_D), L(r^*_L)) \]

where \( \epsilon_L(r_L) \equiv -\frac{r_L^L(r_L)}{L(r_L)} > 0 \) is the price elasticity of demand in the loan market, and \( \epsilon_D(r_D) \equiv \frac{r_D^D(r_D)}{D(r_D)} > 0 \) is the price elasticity of supply in the deposit market.

3 Analysis

Now, define \( F(r_L, r_D; \theta_L) \equiv \{(r_L - \bar{r}) - \frac{\partial C}{\partial D}(D(r_D), L(r_L))\} \epsilon_L(r_L) - \theta_L r_L \) and \( G(r_L, r_D; \theta_D, \alpha) \equiv \{(1 - \alpha)\bar{r} - r_D - \frac{\partial C}{\partial D}(D(r_D), L(r_L))\} \epsilon_D(r_D) - \theta_D r_D \). Then,

\[
\begin{bmatrix}
\frac{\partial F}{\partial r_L} & \frac{\partial F}{\partial r_D} \\
\frac{\partial G}{\partial r_L} & \frac{\partial G}{\partial r_D}
\end{bmatrix}
\begin{bmatrix}
\frac{\partial r_L}{\partial \theta_L} \\
\frac{\partial r_D}{\partial \theta_D}
\end{bmatrix}
= -\begin{bmatrix}
\frac{\partial F}{\partial \theta_L} \\
\frac{\partial G}{\partial \theta_D}
\end{bmatrix},
\]

which indicates

\[
\begin{bmatrix}
\frac{\partial r_L}{\partial \theta_L} \\
\frac{\partial r_D}{\partial \theta_D}
\end{bmatrix}
= -\frac{1}{\det(K)} \begin{bmatrix}
-\frac{\partial G}{\partial r_D} r_L \\
\frac{\partial G}{\partial r_D} r_L
\end{bmatrix},
\]

where
\[
\det(K) \equiv \left( \frac{\partial F}{\partial r_L} \right) \left( \frac{\partial G}{\partial r_D} \right) - \left( \frac{\partial F}{\partial r_D} \right) \left( \frac{\partial G}{\partial r_L} \right) - \left( \frac{\partial^2 C}{\partial L \partial D} \right)^2 D'L'\epsilon_L\epsilon_D > 0
\]

because it is assumed that

\[
\frac{\partial F}{\partial r_L} = \left( r_L - \tau \right) \epsilon_L' + \left( 1 - \frac{\partial^2 C}{\partial L^2} \right) \epsilon_L - \theta_L > 0
\]

and

\[
\frac{\partial G}{\partial r_D} = \left( (1 - \alpha)\tau - r_L - \frac{\partial C}{\partial D} \right) \epsilon_D' + \left( -1 - \frac{\partial^2 C}{\partial D^2} \right) \epsilon_D - \theta_D > 0.
\]

Hence, an increase in \( \theta_L \) raises the lending rate:

\[
\frac{\partial r_L}{\partial \theta_L} = \frac{\partial G}{\partial r_D} \frac{r_L}{\det(K)} > 0
\]

whereas whether it raises or lowers the deposit rate depends on the sign of the cross partial derivative of the cost function, \( C(D, L) \):

\[
\frac{\partial r_D}{\partial \theta_L} = \frac{\frac{\partial^2 C}{\partial L \partial D} \cdot \left( L'\epsilon_D r_L \right)}{\det(K)} \frac{\geq 0}{< 0} \leq 0.
\]

Specifically, if the marginal cost of loan or deposit increases for a larger amount of deposit or loan, respectively (\( \frac{\partial^2 C}{\partial L \partial D} > 0 \)), the deposit rate decreases if the conduct parameter in the loan market \( \theta_L \) increases.

Similarly, the effect of an increase in the conduct parameter in the deposit market \( \theta_D \) on the equilibrium loan and deposit rates is captured by

\[
\begin{bmatrix}
\frac{\partial r_L}{\partial \theta_D} \\
\frac{\partial r_D}{\partial \theta_D}
\end{bmatrix}
= \frac{1}{\det(K)} \begin{bmatrix}
\frac{\partial^2 C}{\partial L \partial D} \cdot \left( L'\epsilon_D r_L \right) \\
\frac{\partial F}{\partial r_L} \frac{r_D}{\det(K)} \geq 0
\end{bmatrix}
\]

which implies that if the marginal cost of loan or deposit increases for a larger amount of deposit or loan, respectively, the lending rate increases if the conduct parameter in the deposit market
$\theta_D$ increases.

Finally, it is shown that the an increase in the rate for compulsory reserves has a similar effect. Specifically,

$$
\begin{bmatrix}
\frac{\partial r_L}{\partial \alpha} \\
\frac{\partial r_D}{\partial \alpha}
\end{bmatrix}
= \frac{1}{\det(K)} \begin{bmatrix}
\frac{\partial^2 C}{\partial L \partial D} (D' \epsilon_L r D) \\
\frac{\partial F}{\partial r_L r D}
\end{bmatrix}_{>0}
$$

that is, an increase in $\alpha$ unambiguously raises the deposit rate $r_D$, whereas whether it also raises the lending rate $r_L$ depends on the sign of $\frac{\partial^2 C}{\partial L \partial D}$.

References


