

Lecture 3: The Theory of the Banking Firm and Banking Competition

This lecture focuses on the industrial organisation approach to the economics of banking, which considers how banks as firms react optimally to their environment. It gives an alternative way of justifying the existence of banks – that they produce services. We are first going to explore the various models of banking competition, before noting some empirical evidence.

Models of banking competition

Background – Money Multiplier

Banking as production of loans and deposits; banks' assets are reserves (R) and loans (L) and liabilities deposits (D)

Central bank reserve coefficient α on deposits constrains balance sheets

Aggregation (aggregate compulsory reserves= M_0) allows derivation of the credit/money multiplier model, where monetary expansion gives rise to increase in loans and deposits:

$$M_0 = \alpha D$$

$$\Delta D = \Delta M_0 / \alpha$$

$$\Delta L = \Delta M_0 (1/\alpha - 1)$$

so $\Delta D / \Delta M_0 = 1/\alpha > 0$ money multiplier

and so $\Delta L / \Delta M_0 = (1/\alpha - 1) > 0$ credit multiplier

Problem, banks seen as passive agents, so look at banks as firms

Perfect competition in the banking sector

Assume there are n banks, cost function $C(D, L)$ with diminishing returns

Banks as price takers for loans r_L , deposits r_D and interbank r

Bank profits, allowing for management costs

$$\pi = r_L L + r M - r_D D - C(D, L)$$

Net interbank position of individual bank

$$M = (1 - \alpha) D - L$$

Profits can be rewritten as sum of intermediation margins on loans and deposits, net of management costs

$$\pi(D, L) = (r_L - r)L + (r(1 - \alpha) - r_D)D - C(D, L)$$

Profit maximisation, given assumptions on cost function (decreasing returns to scale and convex)

$$\begin{cases} \frac{\partial \pi}{\partial L} = (r_L - r) - \frac{\partial C}{\partial L}(D, L) = 0 \\ \frac{\partial \pi}{\partial D} = (r(1 - \alpha) - r_D) - \frac{\partial C}{\partial D}(D, L) = 0 \end{cases}$$

So competitive bank sets intermediation margins equal to marginal management costs. Increase in deposit rate reduces demand for deposits - increase in loan rate raises demand for loans. Cross effects depend on economies of scope between D and L

Competitive equilibrium - three markets for loans, deposits and interbank (M), which no individual bank can affect (although authorities can affect sector via monetary policy actions)

$$I(r_L) = \sum_{n=1..N} L_n(r_L, r_D, r)$$

$$S(r_D) = B + \sum_{n=1..N} D_n(r_L, r_D, r)$$

$$\sum_{n=1..N} L_n(r_L, r_D, r) = (1 - \alpha) \sum_{n=1..N} D_n(r_L, r_D, r)$$

The Klein Monti model of monopoly

Perfect competition inappropriate in banking as barriers to entry

- regulatory/structural regulation
- expertise, reputation and relationships
- other sunk costs

- so take other extreme case of monopoly (one bank in economy)

Hence for individual bank, downward sloping demand function for loans L (r_L) and upward sloping deposit function D (r_D) appropriate (inverses $r_L(L)$ and $r_D(D)$)

Bank decides on amount of loans L and deposits D , which affect corresponding interest rates

Derive profit maximisation conditions

Profit function

$$\pi = \pi(L, D) = (r_L(L) - r)L + (r(1 - \alpha) - r_D(D))D - C(D, L)$$

First order conditions

$$\frac{\partial \pi}{\partial L} = r'_L(L)L + r_L - r - C'_L(D, L) = 0$$

$$\frac{\partial \pi}{\partial D} = -r'_D(D)D + r(1 - \alpha) - r_D - C'_D(D, L) = 0$$

Elasticities of demand (Loans) and supply (Deposits)

$$\varepsilon_L = -\frac{r_L L'(r_L)}{L(r_L)} > 0 \quad \text{and} \quad \varepsilon_D = \frac{r_D D'(r_D)}{D(r_D)} > 0$$

Solutions (rearranging)

$$\frac{r_L^* - (r + C'_L)}{r_L^*} = \frac{1}{\varepsilon_L(r_L^*)},$$

$$\frac{r(1 - \alpha) - C'_D - r_D^*}{r_D^*} = \frac{1}{\varepsilon_D(r_D^*)}$$

- Gives equality between Lerner indices (price minus cost divided by price) and inverse elasticities. The greater market power banks have, the smaller the elasticities and the higher the Lerner index, hence higher intermediation margins (lower deposit rates and higher loan rates)
- So a monopolistic bank sets volume of loans and deposits to equate Lerner index to inverse elasticities
- Bank can separate its decision process as optimal deposit rate is independent of the loan market and vice versa.
- Implies intermediation margins reduced as substitutes for banking products appear

Oligopoly variant

Reinterpretation of Klein Monti as Cournot competition where banks ignore others' reactions (elasticities are multiplied by N (number of banks)).
More banks, less market power.
Limiting case of perfect competition with $N \rightarrow \infty$

Double Bertrand competition

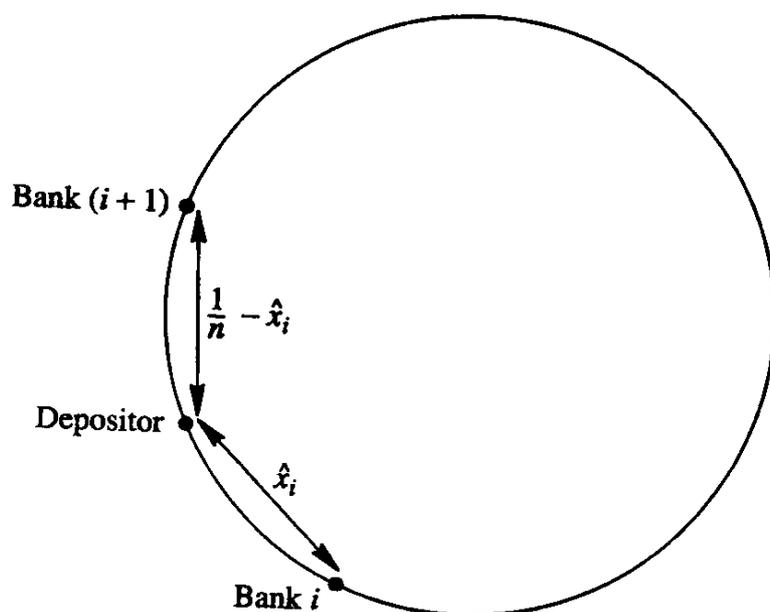
Standard critique of Cournot assumptions – why should large banks ignore others' behaviour?
Reasonable to assume follow others' behaviour and competition in two markets (loans and deposits)
But some counter intuitive results – often cannot reach a Walrasian equilibrium or no equilibrium at all

Monopolistic competition

Assumptions of product differentiation introduced

Salop model and role of distance travelled by consumer (location differentiates products)

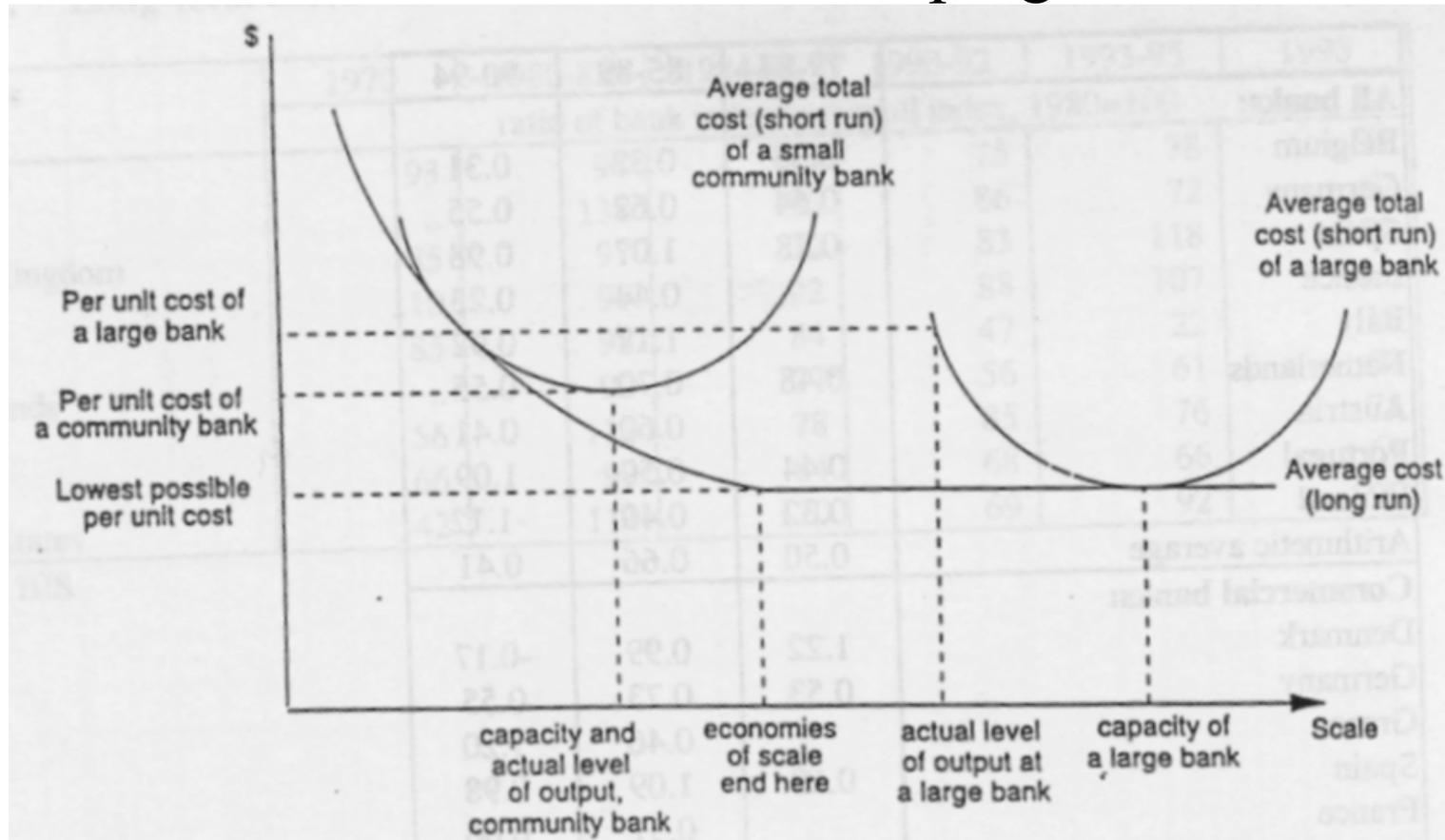
Optimum is minimisation of sum of set-up costs and transportation



But if there is free entry may be excessive capacity (standard critique of monopolistic competition) – so could justify limits on entry or branching

Excess capacity under monopolistic competition?

- Local bank does not reach size to minimise costs but sustainable due to downward sloping demand curve



Further types of industrial competition and their application to banking

Contestable markets

Relevance of potential competition may increase with deregulation

Are there sunk costs in banking?

(reputation, relationships, expertise)

- less for deposits than loans?

Strategic competition

What strategic instruments do banks have, to generate or exploit sunk costs?

-predatory pricing?

-excessive research?

-financial innovations?

-exploit “intertemporal advantages” of relationships, reputation and expertise?

Empirical evidence:

(1) Excess capacity in banking

Assume banking has common technology, why does banking market structure differ crosscountry?

Excess capacity under competitive paradigms

- Inappropriate scale in perfect competition
- X-inefficiency and high prices in imperfect competition
- Monopolistic competition and excess capacity

Free entry - Profit and risk based measures (see next slide)

Restricted entry - Dispersion and capacity based measures (see table in Lecture 1)

A profitability-based measure of potential excess capacity using returns on equity

(source: IBCA) – 1989-1995

1 Benchmark for low earning (equal to real money market rate)

percentage points

	BE	DK	DE	GR	ES	FR	IE	IT	NL	AT	PT	FI	SE	UK
	3.00	4.34	2.31	1.40	2.11	3.46	3.51	2.14	3.29	2.43	1.77	3.71	2.49	2.11

2 Percentage of banks having returns on equity below the benchmark

	BE	DK	DE	GR	ES	FR	IE	IT	NL	AT	PT	FI	SE	UK
	30.64	41.57	19.53	24.90	29.98	38.26	29.74	12.06	29.34	18.08	16.23	62.40	21.19	27.56

3 Percentage of bank assets held by banks having returns on equity below the benchmark

	BE	DK	DE	GR	ES	FR	IE	IT	NL	AT	PT	FI	SE	UK
	13.40	56.14	9.63	27.21	11.93	27.66	28.55	20.31	10.57	5.66	4.58	74.16	20.78	40.16

(2) The nature of competition (De Bandt and Davis 2000)

Use of Rosse-Panzar H statistic
Market power is measured by the extent to which changes in factor prices are reflected in revenues.

With perfect competition, a proportional increase in factor prices induces an equiproportional change in gross revenues; output does not change in volume terms, while the output price rises to the same extent as the input price (i.e. demand is perfectly elastic).

Under monopolistic competition, revenues will increase less than proportionally to changes in factor prices, as the demand for banking

products facing individual banks is inelastic (see Klein-Monti model).

In the limiting case of monopoly there may be no response or even a negative response of gross revenues to changes in input costs.

To assess the degree of competition in banking markets, the empirical strategy implies therefore to compute an index defined as the sum of the elasticities of gross revenues to unit factor cost in a reduced form revenue equation (the H-Statistic).

Perfect competition, $H=1$

Imperfect competition $H<1$

Monopoly, $H=0$ or less

Some results for France, Germany, Italy and the US

H Statistics For the German Sample (Standard Errors In Parentheses)

1992-1996	Full period OLS	Fixed effects without time dummies	Fixed effects with time dummies	“Between” estimator
1. Large banks : number of observations	360	360	360	360
<i>1.1. Total Income</i>				
<i>1.1.1. Staff costs/deposits and loans</i>	0.594 ^{MC} (0.085)	0.297 ^{MC} (0.075)	0.628 ^{MC} (0.084)	1.125 ^C (0.304)
<i>1.1.2. Staff costs/staff numbers</i>	NA	[1.130 ^C (0.220)]	NA	NA
<i>1.2. Interest Income</i>				
<i>1.2.1. Staff costs/deposits and loans</i>	0.570 ^{MC} (0.091)	0.248 ^{MC} (0.069)	0.540 ^{MC} (0.080)	0.971 ^C (0.326)
<i>1.2.2. Staff costs/staff numbers</i>	NA	[0.983 ^C (0.245)]	NA	NA
2. Small banks : number of observations	1265	1265	1265	1265
<i>2.1. Total Income</i>				
<i>2.1.1. Staff costs/deposits and loans</i>	-0.023 (0.037)	0.113 ^{MC} (0.033)	0.153 ^{MC} (0.038)	-0.163 (0.138)
<i>2.1.2. Staff costs/staff numbers</i>	NA	[0.051 (0.131)]	NA	NA
<i>2.2. Interest Income</i>				
<i>2.2.1. Staff costs/deposits and loans</i>	-0.070 ^M (0.037)	0.058 (0.029)	0.181 ^{MC} (0.033)	-0.354 ^M (0.139)
<i>2.2.2. Staff costs/staff numbers</i>	NA	[0.010 (0.121)]	NA	NA

H Statistics For the US Sample (Standard Errors In Parentheses)

1992-1996 (commercial banks only)	Full period OLS	Fixed effects without time dummies	Fixed effects with time dummies	“Between” estimator
1. Large banks : number of observations	620	620	620	620
<i>1.1. Total Income</i>				
<i>1.1.1. Staff costs/deposits and loans</i>	0.831 (0.049)	0.520 (0.035)	0.560 (0.036)	1.058 (0.127)
<i>1.1.2. Staff costs/staff numbers</i>	0.871 (0.058)	0.718 (0.043)	0.729 (0.049)	1.125 (0.153)
<i>1.2. Interest Income</i>				
<i>1.2.1. Staff costs/deposits and loans</i>	0.486 (0.058)	0.283 (0.040)	0.327 (0.042)	0.666 (0.156)
<i>1.2.2. Staff costs/staff numbers</i>	0.589 (0.070)	0.537 (0.051)	0.546 (0.058)	0.805 (0.189)
2. Small banks : number of observations	635	635	635	635
<i>2.1. Total Income</i>				
<i>2.1.1. Staff costs/deposits and loans</i>	0.335 (0.047)	0.205 (0.038)	0.207 (0.043)	0.403 (0.131)
<i>2.1.2. Staff costs/staff numbers</i>	0.570 (0.050)	0.323 (0.043)	0.243 (0.051)	0.784 (0.129)
<i>2.2. Interest Income</i>				
<i>2.2.1. Staff costs/deposits and loans</i>	0.273 (0.047)	0.166 (0.038)	0.171 (0.043)	0.387 (0.130)
<i>2.2.2. Staff costs/staff numbers</i>	0.468 (0.050)	0.294 (0.043)	0.225 (0.052)	0.704 (0.128)