



**School of Finance & Law
Working Paper Series**

**A General Test of Competitive Conditions in the UK Building
Society Mortgage Market: 1990-1995.**

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No. 11.

1998

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Published 1998 by the School of Finance and Law, Bournemouth University, Talbot Campus, Fern Barrow,
Poole, Dorset, BH12 5BB.

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ISBN 1-85899-057-2

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A catalogue record for this publication is available from the British Library.

Acknowledgements

I would like to thank P. Hardwick and D. McKillop for their insightful comments and continued encouragement and B. Maughan for his helpful suggestions on an earlier draft of the paper. The assistance of the Building Societies Association is acknowledged in the collation of the data set. The usual disclaimer applies.

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A general test of competitive conditions in the UK building society mortgage market:

1990-1995.

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Abstract

The Rosse-Panzar statistic is used to test for market conduct and contestability within the UK building society mortgage market between 1990 and 1995. The statistic considers the distinction between monopolistic competition and profit maximising monopoly. Following Panzar and Rosse (1987), analysis of monopolistic competition can be seen to be concerned with both an individual and a group equilibrium. The comparative static approach of the Rosse-Panzar statistic is employed to test for this situation. Evidence of long-run competitive equilibrium or profit maximising monopoly is rejected. Presence of a contestable market with monopolistic competition is not rejected. The stability of incumbents market share is employed to test for a small firms bias (Shaffer, 1982). Evidence of a small firms bias is rejected.

Introduction

During the 1990s the UK building society sector has undergone many regulatory and structural changes. Paramount amongst such developments has been the intensification of competition in the mortgage market as a range of proprietary institutions have entered this market. Accounting for such change, an empirical analysis of the competitive conditions prevalent in the building society mortgage market is deemed timely.

The 1986 Building Societies Act (Section 5) specifies that building societies are established “ ... for the purpose of raising, primarily through subscriptions of members, a stock or fund for making them advances secured on land for their residential use”. Thus building societies may be viewed as acting principally as intermediators of savings (term, share and investment deposits) into mortgage loans. Due to the distinct mutual ownership form of building societies, the customers or members are the *de facto* owners of the society. This mutual ownership form differs from the proprietary form of many of the new entrants to the market in that shareholders are not present, reducing the demands on the resources of building societies. This distinct ownership structure coupled with the discrete regulation of building societies have enabled building societies to consistently provide lower cost mortgages, making building society mortgages a historically distinct mortgage service, in the UK.

This paper employs an intermediation model (see Sealey and Lindley, 1977) of bank production to quantify the conduct and behaviour within the building society mortgage market for the sample period, 1990-95. Contestability theory (Baumol *et al*, 1982) is used to generalise differences in the conduct of firms. Presence of market conduct forms including monopolistic competition and long-run competitive equilibrium are tested with the Rosse-Panzar statistic (Panzar and Rosse, 1987).

Consideration of contestability theory is deemed appropriate in light of the recent developments in this market. The new entrants of the 1980s, to the mortgage market, particularly the specialised mortgage lenders and banks, may have contributed to the reduced profitability and the large losses that characterising the building society sector the early 1990s. These entrants may be characterised both by their proprietary form and to a lesser extent the brevity of their presence in the mortgage market. Previous evidence, using the Rosse-Panzar statistic for the UK retail bank loan market indicates conditions of monopolistic competition (Molyneux *et al* 1994). Broader surveys of the inefficiency and performance of depository institutions and European banking markets are considered by Hardwick and Ashton (1996) and Molyneux *et al* (1996) respectively.

Contestable market theory and monopolistic competition

Contestability theory (Baumol *et al*, 1982) can be viewed as a special case of classical competitive market theory. The theory was proposed to generalise differences in market structure and as a powerful tool for improving the regulation of industry. It is

suggested that " ... perhaps the most noteworthy implication of contestability theory is that a wide difference in appearance between a particular market and the form of perfect competition need not deprive the invisible hand of its power to protect the public interest" (Baumol *et al*, 1982 pp.447). The influential nature of this theory within economics has been described as " ... a 'rebellion' which does without benefit of the conjectural variation, reaction functions, and other paraphernalia of standard oligopoly analysis" (Baumol, 1982, pp.1).

Contestability emphasises the assumption that an 'imperfect' industrial structure may allow a long run competitive equilibrium to form. This is hypothesised to occur through the potential entry of competing firms to the market during disequilibrium. Anticipated competition, both real or imaginary, is viewed to engender competitive behaviour of incumbents with a market. Central aspects of contestability may be defined as the static form of the model, hypothesised free entry and exit of institutions to the marketplace with no consideration of time lag for retaliation or sunk costs, and the assumption that potential entrants to the market are price takers, freely accepting the present incumbents' previous entry prices. Thus " ... the critical feature of a contestable market is its vulnerability to hit and run entry" (Martin, 1993, pp.300).

The theory of contestability applied to monopolistic competition, developed by Chamberlin in 1933, may be viewed as contradictory. Chamberlin suggested that product differentiation is the distinguishing characteristic of this market conduct. Product differentiation is achieved through such factors as " ... quality, design, color, or style",

where " ... in so far as these and other intangible factors vary from seller to seller, the 'product' in each case is different" (pp.56). Baumol *et al* amended for this by suggesting that an " ... entrant can closely or exactly duplicate the product design of the firm depicted", (pp.332) or if each variant is sold by at least two suppliers, perfect contestability will lead to marginal cost pricing. Martin (1993) considers this revision in greater depth.

Firms within a monopolistic market selling differentiated products can be viewed to be qualitatively indistinguishable from classical profit maximising monopolists at the firm level. To elaborate this point, Chamberlin emphasised that as " ... long as the substitutes are to any degree imperfect, he (*the firm*) still has a monopoly of his own product and control over its price within the limits imposed upon any monopolist - those of demand" (pp.67). The mortgage provider is therefore assumed to provide a financial service with distinct characteristics. The provision of a mortgage with these exact characteristics is possible only through the one mortgage provider. Thus at the firm level a monopolistically competitive firm and a monopolist are indistinguishable. Following Baumol, whilst characteristics may be viewed as distinct on a firm level, at the industry level substitute characteristics, deemed equivalent by the consumer, may be incorporated within the service by other incumbent providers. The distinction between monopolistic competition and profit maximising monopoly may then be observed at the group or industry level. Analysis of monopolistic competition can be seen to be concerned with both an individual equilibrium and a group equilibrium (Panzar and Rosse, 1987). To test

for this situation the comparative static approach of the Rosse-Panzar statistic is employed.

The Rosse-Panzar statistic.

A Rosse-Panzar statistic may be used to test for long run competitive equilibrium and monopolistic competition or long-run Chamberlinian equilibrium. Through employing firm level observations a general quantification of market conduct may be made. The testing procedure is undertaken in two stages. Validity of the overall or competitive equilibrium test demands the sample be in long-run equilibrium. Presence of long run equilibrium is initially tested. The competitive environment statistic, which may then be quantified, can be viewed as the sum of firm level elasticities of average revenue with respect to input prices. If the sum of elasticities, termed H within the literature, is significantly different from one then long run competitive equilibrium is rejected. A value between zero and unity indicates monopolistic competition or long-run Chamberlinian competition cannot be rejected. The differing interpretations of the H statistic, summarised by Molyneux *et al* (1994), are displayed in Table 1.

Table 1 Interpretations of the H statistic

| | | |
|------------------------------|--|---------------------|
| Competitive environment test | | Equilibrium test |
| H<0 | Monopoly or conjectural variations short-run oligopoly, or perfect colluding oligopoly | <0 = Disequilibrium |
| 0<H<1 | Monopolistic competition | 0 = Equilibrium |
| H=1 | Perfect competition, or | |
| H=1 | Natural monopoly in a perfectly contestable market, or | |
| H=1 | Sales maximising firm subject to a break-even constraint | |

Molyneux *et al* (1994)

How the statistic enables testing for distinct forms of market conduct and behaviour may be explained intuitively. More rigorous 'proofs' of the statistic are contained within Shaffer (1982), Panzar and Rosse, (1987) and Nathan and Neave (1989). The H statistic quantifies the impact on average revenue or output price of a proportional increase in all input prices. Average cost is assumed to be linearly homogeneous in input prices so a one per cent increase in input prices will inflate average costs by one per cent for all output levels. The symmetry assumption is imposed *a priori* and presupposes that the quantity of output produced will not vary with differing forms of market conduct.

Under monopolistic competition or large group Chamberlinian equilibrium, a rise in average costs would initially limit output and in turn reduce revenue. Through imposing the *a priori* assumption that the elasticity of demand of a firm under symmetric monopolistic competition will increase with the number of substitutes for a product, the degree of 'competitiveness' or 'contestability' of the market may be quantified. Thus the value of the H statistic between zero and unity should indicate the degree of control

incumbent firms possess over their differentiated product markets, the degree to which shifts in the market demand curve affect the reduced form revenues, or the contestability of the market. A lower value of H will indicate a higher level of control over differentiated product markets or a lower level of contestability.

Under long-run competitive equilibrium an increase in average costs will, in the short-term, reduce revenues, leading to the exit of incumbents. This exit will increase the demand for the remaining incumbents. Following established theory, in the long run, an unchanged equilibrium level of output is expected. A proportional increase in revenue for the remaining incumbents will give a value of unity for the H statistic.

A number of potential difficulties with the statistic have been suggested. Shaffer (1982) emphasised the importance of considering firms operating within the same market. He also stressed that the presence of many small firms may disguise the presence of disequilibrium. This would cause the estimate of H to fall and make a negative value more likely, regardless of the conduct prevalent within the market. Following recommendations made by Shaffer, the stability of market shares within the sample over the sample period are examined to test if such bias is occurring. When the market shares display stability a bias by the small firms effect may be rejected. When instability is recognised, a small firms effect may be present leading to lower than expected H statistic results. Additionally, the limited definition of the production process denoted by the truncated functional form, may be viewed as a blunt approximation of the true productive technology (Perrakis, 1991).

Previous studies

Nathan and Neave (1989) applied the Rosse-Panzar statistic for a sample of Canadian financial institutions. Cross-sectional samples of 14 schedule A and 58 schedule B banks and 39 trust companies are considered for 1982 and 1984. Monopolistic behaviour is indicated for Canadian financial institutions. Molyneux *et al* (1994) used the Rosse-Panzar statistic to assess competitive conditions in a number of European banking markets. This broad ranging study incorporates a number of controls for risk, cost and size characteristics of the institutions considered. A sample of German, French, Italian, Spanish and UK banks were considered between 1986-89. The study indicates that monopolistic competition exists within the UK banking market (a result of 0.628 was recorded for the Rosse-Panzar statistic). Similar results were obtained for the other European markets.

Data

A balanced data set of 77 building societies between 1990 to 1995 is employed. The data, drawn from Annual Reports and Accounts of the building societies, is pooled for two periods of 1990-1992 and 1993-1995 and deflated for 1993 prices by the RPI. Average levels of building society profit are variable over the sample period. An average profit of approximately £16m was enjoyed between 1990 and 1991 across the 77 societies. A considerable rise in average profits is recorded for 1994 and 1995, when levels of £22m are achieved. Interest payable and receivable, both overall and specifically

on retail deposits and non-retail deposits have displayed a gradual decline. This trend mirrors the underlying interest rate prevailing within the economy as a whole. The differential between interest received and interest payable rises over the period from £46m in 1991 to £64m in 1995 indicating an overall rise of nearly 40 per cent over the entire period. This change is perhaps an indication of the instability of interest rates, a reduction in the level of competition or a move towards greater internal reserve generation.

Model specification

To investigate competitive conditions a revenue function is specified, assuming an intermediation model of bank production (see Sealey and Lindley, 1977). It is assumed that mortgage loans are produced using labour, capital and deposits. Revenue from mortgages is the interest receivable on mortgages. The model form employed follows the approach performed by Molyneux *et al* (1994). This enables a comparison of our results with the estimations for the UK retail banking sector.

The equilibrium test employed is similar to those used in previous studies (for example Molyneux *et al*, 1994, Shaffer, 1982 and Nathan and Neave, 1989). The equilibrium test is based on the assumption that within equilibrium long run competitive capital markets will equalise risk-adjusted rates of return across financial institutions. It would therefore be expected that in equilibrium the rates of return should not be correlated with input prices. This is tested by imposing return on assets (ROA) as the dependant variable in the regression equation.

Equilibrium test

$$LnROA = a + bLnPL + cLnPK + dLnPF + j LnAss + fLnCapass + hLnLoanass$$

Competitive environment test

$$LnTrass = a + bLnPL + cLnPK + dLnPF + j LnAss + fLnCapass + hLnLoanass$$

Where:

$Ln =$ Logarithm

$Trass =$ Total mortgage interest revenue per pound sterling of total assets (Average revenue)

$ROA =$ Return on assets (Ratio of profits after tax to total assets)

$PL =$ Labour expense per full time employee

$PK =$ Capital expenses per pound of fixed assets

$PF =$ Ratio of retail fund interest payable to total retail funds (unit price of retail funds)

$Ass =$ Total assets

$LoanAss =$ Mortgage to assets ratio

$Capass =$ Ratio of provision for bad and doubtful debts to total assets

A number of environmental variables are included within the revenue function to control of firm specific and external factors that may be associated with revenue. By controlling for factors that may systematically vary with the dependant variables estimation bias may be reduced. Total assets are used to control for different building society sizes and potential economies of scale. LoanAss considers the loans to assets ratio enabling insight into the relationship between the proportion of loans and revenue. Capass uses the level of provisions for bad and doubtful debts as proxy for the level of risky behaviour of the building society. This variable is devised to control of the potentially higher or lower profits that may be associated with risky behaviour.

Results

Parameter estimates, diagnostic statistics and H statistics are displayed in Table 2. Recorded levels of T statistics and diagnostic statistics indicate an acceptable degree of specification error. The labour coefficient is positive for both periods yet significant for only 1995. Estimates for the capital price coefficient are indecisive. The deposit price coefficient is significant and positive for both periods indicating the relative importance of this input within the revenue function. The control for total asset size appears indecisive, shifting sign between the time periods. The Capass coefficient appears positive. This result broadly indicates the level of provisions for risky loans and revenue may be positively correlated. The Loansass variable is positive for both periods and significant for one, weakly indicating the proportion of loans and revenue may be positively correlated. The

equilibrium test indicates significant disequilibrium for 1990-1992. Equilibrium is not rejected for 1993-1995. The results indicate only weak inference may be drawn for the disequilibrium period. The competitive environment H test allows rejection of long-run competitive equilibrium for both time periods. A degree of monopolistic competition may be observed for the building society sector between 1990 and 1995.

Table 2 Estimates

| | | | | |
|------------------|------------------------------|-----------|-----------------------------|------------|
| Competitive | environment test | | 1993-1995 | |
| | 1990-1992 | | | |
| α | -0.7043 | (0.6810)* | -1.0827 | (0.1281)* |
| β | 0.0041 | (0.0053) | 0.00828 | (0.0051)* |
| χ | -0.0077 | (0.0079) | 0.0021 | (0.0081) |
| δ | 0.5611 | (0.0223)* | 0.4940 | (0.0346)* |
| ϕ | -0.0089 | (0.0023)* | 0.0103 | (0.00205)* |
| φ | 0.5053 | (0.0402)* | 0.4928 | (0.0366)* |
| η | 0.0041 | (0.0012)* | 0.0157 | (0.0016)* |
| Equilibrium test | | | | |
| α | -2.195 | (0.4837)* | -5.7201 | (0.7132)* |
| β | -0.0885 | (0.0376)* | -0.0437 | (0.0285) |
| χ | -0.0384 | (0.0559) | -0.0227 | (0.0449) |
| δ | 0.4774 | (0.1583)* | -0.1674 | (0.0193)* |
| ϕ | -0.0765 | (0.0164)* | 0.0037 | (0.0114) |
| φ | 1.497 | (0.2854)* | 0.2802 | (0.2037) |
| η | -0.0077 | (0.0082)* | 0.0032 | (0.0087) |
| | Competitive environment test | | Equilibrium test | |
| 1990-1992 | Adj. R ² = 0.8403 | | Adj. R ² = 0.185 | |
| 1993-1995 | Adj. R ² = 0.565 | | Adj. R ² = 0.016 | |
| 1990-1992 | F statistic = 208.01* | | F statistic = 9.91* | |
| 1993-1995 | F statistic = 52.2* | | F statistic = 1.64 | |
| 1990-1992 | Durbin Watson = 1.954 | | Durbin Watson = 2.1213 | |
| 1993-1995 | Durbin Watson = 2.01 | | Durbin Watson = 2.1915 | |
| 1990-1992 | Log Likelihood = 311.652 | | Log Likelihood = -153.15 | |
| 1993-1995 | Log Likelihood = 330.071 | | Log Likelihood = -76.824 | |
| | Competitive environment test | | Equilibrium test | |
| 1990-1992 | 0.5647 (0.0231) | | 0.3505 (0.164)* | |
| 1993-1995 | 0.5044 (0.03604) | | -0.2338 (0.2006) | |

* = 10% significance

Market stability may be viewed as the dynamic position of the firm in a market. The degree of market stability of incumbents market share is quantified with three methods. First, a sum of absolute changes in market shares for the building society mortgage market for the top 5, 10 and 15 building societies is taken, following the method

used by Hardwick (1996). Secondly, the correlation of market share and ranks in the mortgage market in different years is made. Thirdly, testing of independence of market share in the mortgage market between different years is performed using the Wilcoxon-Mann-Whitney test.

Results of the tests are presented in Table 3. The sum of absolute changes in market shares indicates the low level of absolute change in market share amongst the largest incumbent building societies within the sample period. The correlation results of ranks of market share are presented in the higher right segment of the table, and market share are presented in the lower left segment of the table. Both set of statistics indicate high levels of correlation between different years in the building society mortgage market and only a slight decline from very high levels of correlation over time. The Wilcoxon-Mann-Whitney test is applied to test for whether the market shares for a specific year have been drawn from the same population as another year. The alternative directional hypothesis is that one year is stochastically larger than another. The null hypothesis is not rejected for all tests with 0.01 significance, indicating stability of market share over the sample period.

Table 3 Tests of the small firms effect

| Sum of absolute changes in market shares | | | | | | |
|---|---------|---------|---------|---------|---------|---------|
| | Top 5 | Top 10 | Top 15 | | | |
| 1990-1991 | -0.1710 | 0.0003 | 0.1020 | | | |
| 1991-1992 | -0.1355 | 0.0130 | 0.0053 | | | |
| 1992-1993 | -0.0411 | 0.0346 | 0.0138 | | | |
| 1993-1994 | -0.0774 | 0.0127 | -0.0018 | | | |
| 1994-1995 | 0.3232 | 0.1192 | 0.0685 | | | |
| Correlation of market shares and market share ranks | | | | | | |
| Rank | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
| Market share | | | | | | |
| 1990 | - | 0.9989 | 0.9984 | 0.9970 | 0.9961 | 0.9937 |
| 1991 | 0.9992 | - | 0.9993 | 0.9980 | 0.9974 | 0.9948 |
| 1992 | 0.9981 | 0.9995 | - | 0.9999 | 0.9981 | 0.9954 |
| 1993 | 0.9981 | 0.9992 | 0.9996 | - | 0.9993 | 0.9965 |
| 1994 | 0.9976 | 0.9980 | 0.9981 | 0.9981 | - | 0.9967 |
| 1995 | 0.9835 | 0.9783 | 0.9977 | 0.9802 | 0.9844 | - |
| The Wilcoxon-Mann-Whitney test | | | | | | |
| Z | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
| 1990 | - | -0.0418 | -0.0296 | -0.0767 | -0.1028 | -0.3642 |
| 1991 | -0.0418 | - | -0.0557 | -0.0418 | -0.0610 | -0.3102 |
| 1992 | -0.0296 | -0.0557 | - | -0.1011 | -0.1150 | -0.3869 |
| 1993 | -0.0767 | -0.0418 | -0.1011 | - | -0.0279 | -0.2946 |
| 1994 | -0.1028 | -0.0610 | -0.1150 | -0.0279 | - | -0.2789 |
| 1995 | -0.3642 | -0.3102 | -0.3869 | -0.2946 | -0.2789 | - |

Conclusions

The study indicates monopolistically competitive conduct is present in the UK building society mortgage market during the 1990s. The building society mortgage market may be viewed as displaying a degree of contestability over the sample period. Such a result occurs at a time of rising profitability of the sector as a whole, further indicating the

lack of long run competitive equilibrium of sales maximisation under a break even constraint. Bias in the Rosse-Panzar statistic resulting from instability in market share of building societies is rejected. The UK building society mortgage market appears to be operating under similar competitive conditions as the UK retail bank loan market. The slightly lower level of contestability within the building societies mortgage market may indicate perhaps the superior performance or competitive advantage of mutual building societies within their core market.

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