

EXAMINING THE PROFIT-EFFICIENCY RELATIONSHIP IN IRISH CREDIT INSTITUTIONS

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Introduction

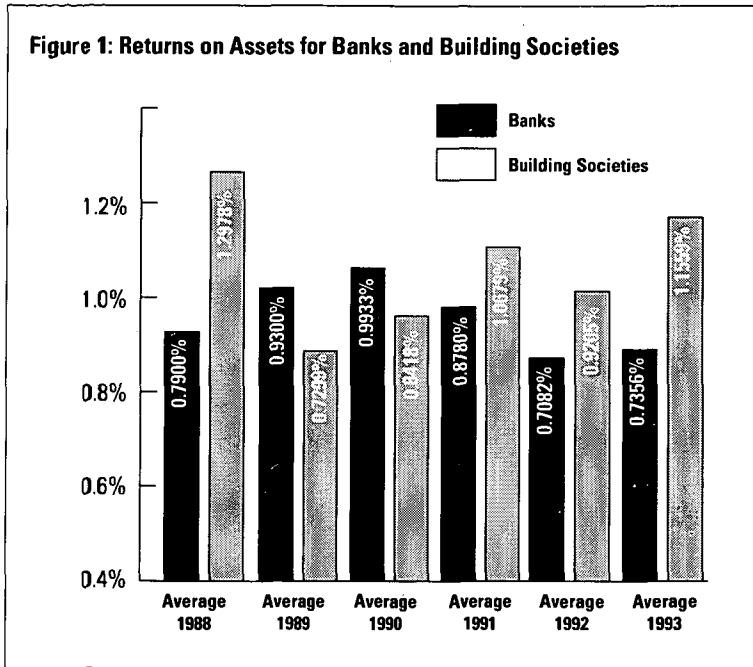
The aim of this paper is twofold, first to present evidence regarding the returns earned by depository credit institutions in Ireland and second, the bulk of the paper, to look at the possible theories that might be hypothesized to explain the profitability and profit levels of these bodies. A more complete explanation of the profit behaviour of Irish depository credit institutions than is provided here would require a great deal more information – information possessed by the regulatory authorities, and yet to be made available.

The Credit Institutions Sector in Ireland

The main institutions operating in the credit sector in Ireland are Licensed Banks, Building Societies (agencies which have historically operated as mortgage lenders) and a number of state sponsored specialist banks. All of these sectors are represented in this study, but not fully. Since 1987, with the creation of an International financial Services Centre in Dublin, there has been an increasing international banking presence in the Irish banking sector. While these banks are domiciled in Ireland, and are licensed by and appear in the data of, the Central Bank of Ireland, they are not active in the domestic market. Only non resident transactions are allowable for the extensive tax based incentives. consequently, the market of analysis here, the loan and deposit market, relates to the resident transactions of resident offices of Irish licensed banks and building societies. Within this sector, the main overlap between the banks (including the state sponsored credit institutions) and the Building Societies has been the mortgage market. However, the 6 building societies analysed here account for an aggregate mortgage loan equivalent to twice that of the banking sector, as of 1993, the end of the period of analysis. It was only since 1990, over midway through the time period of analysis here, that the banks began to make substantial inroads into the mortgage market.

The data availability varies according to the status of the banks. For those banks which have PLC status, there are of course audited and publicly available accounts. This is only a small number of banks. Those that operate on the basis of a private company or are branches of other EU banks are required merely to display their aggregate balance

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sheet data. None of these banks are included. However, the major banks are all either PLC or are voluntary publishers of substantial data. Accordingly, these are the banks included in the analysis, as they generally tend to be those that are operating in the resident market.

For building societies, there is a requirement to publish, through the regulatory agency, the annual profit/loss and balance sheet data. The profit histories of the sectors have also diverged. Figure 1, above, shows the average return on assets achieved by banks and by building societies over the period. This paper attempts to find explanations from the industrial economics literature for the return on assets performance of these institutions.

Four Theories in Search of an Explanation

This section of the paper looks at variations on the traditional Structure – Conduct – Performance (SCP) and Relative Efficiency RE theories. The objective here is not to provide a comprehensive analysis of the area but instead to outline the theories and show the microeconomic underpinnings of the work to be carried out later. A good analysis of the SCP paradigm is to be found in Hannan (1991) Interested readers are referred to this for detail. Let us now look at the four main theories to be analysed.

- *The Relative Efficiency (RE) theory*—This states that market power and profitability are functions of efficiency (and the realisation of economies) differences across firms. The more efficient the firm is the lower cost of production is for it and therefore the greater will be its market power and profitability.

- *The Traditional Structure-Conduct-Performance (SCP) theory* – This posits that the positive relationships observed between market structure and profits is as a result of oligopolistic behaviour on the part of the firms with greater market power, resulting in prices being set such as to allow a greater degree of economic rent to be extracted.
- *The Relative Market Power (RMP) hypothesis* – This is very similar to the SCP argument. It states that the market share, rather than the degree of concentration *per se* is the important factor in price setting and profit determination.
- *The Quiet Life (QL) hypothesis* – This is conceptually different, stating as it does that there is a degree to which firms will utilise the greater efficiency that they have to relax the strict adherence to cost minimization, and as such this will weaken the profit-structure relationship.

We may formalize these statements to an extent, by providing explicit models of the relationships to be studied. In the RE paradigm we have the following causation: relative efficiency differences are translated, by lowering of the average cost curve, into higher profits, more favourable consumer prices and higher market share. Scale and X efficiencies are the traditional elements that are seen to be reflected in the profitability. Scope efficiencies or cost complementarities are not usually reflected in the efficiencies paradigm. I shall return to this later. Formally, we may represent this formulation as below, with the subscript L standing for loan prices and D for deposit prices, and Z a vector of alternative external factors that are hypothesized to affect price or profit.

$$\pi_i = f_1 \begin{pmatrix} \geq 0 & \geq 0 & 0 & 0 \\ & & & Z \\ X \text{ Scale CR MS,} \end{pmatrix} + \varepsilon_1$$

$$P_L = f_2 \begin{pmatrix} \leq 0 & \leq 0 & 0 & 0 \\ & & & Z \\ X' \text{ Scale, CR' MS,} \end{pmatrix} + \varepsilon_2$$

$$P_D = f_3 \begin{pmatrix} \geq 0 & \geq 0 & 0 & 0 \\ & & & Z \\ X' \text{ Scale, CR' MS,} \end{pmatrix} + \varepsilon_3$$

X and Scale are measures of X efficiency and Scale efficiency, CR is a measure of concentration in the market and MS is a market share variable. The signs above each of the measures are the expected signs of any coefficients in an estimated model. There are two main sub models of the RE model, one of which stresses the scale efficiency importance and the other of which stresses the importance of X efficiency. However, they are not mutually exclusive and neither do they contradict each other. This model

is one popularized by Demsetz (1973) and latterly by Allen & Hagin (1989). In this paper, I intend not to analyse deeply the scale related efficiency measures, as the scale issue has been shown not to be of major importance. Allen and Hagin found that only a very small percentage of increased explanatory power arose from scale efficiencies being included. In addition, there is evidence to show that total efficiency is much more driven by X (technical and allocative efficiencies) than by scale efficiencies. Rangan *et al* (1988) calculated technical efficiencies for 215 US banks and they were found to be more technically inefficient than scale inefficient, a result confirmed later by Berger & Humphrey (1991). Thus, I will concentrate on the X efficiency measures.

The zero expected coefficients on the market share and concentration measures are conditional on efficiency issues. There is no direct link from them to prices and profit. This can be seen if we examine the hypothesis in more detail, as shown below.

$$MS = f \left(\begin{array}{cc} \geq 0 & \geq 0 \\ X & \text{'Scale'Z} \end{array} \right) + \epsilon_4$$

$$CR = f \left(\begin{array}{cc} \leq 0 & \leq 0 \\ X & \text{'Scale'Z} \end{array} \right) + \epsilon_4$$

What this tells us when combined with the RE model above is that the structure and performance measures are related to each other due to efficiency measures and efficiency issues. More efficient firms tend to gain greater market share and are found in more concentrated markets as a result, concentration ratios being simple functions of market shares. Profitability is positively related to concentration as both are positively related to efficiency measures. This is unconditional – the relationship between profit and concentration – however, and accounts for the spurious observed relationship. We may also look at the market power models (RMP and SCP) in a similar format.

$$\pi_i = f_1 \left(\begin{array}{cccc} \geq 0 & \geq 0 & \geq 0 & \geq 0 \\ & & & Z \\ X & \text{'Scale,CR'&MS,} & \end{array} \right) + \epsilon_5$$

$$P_L = f_2 \left(\begin{array}{cccc} \leq 0 & \leq 0 & \geq 0 & \geq 0 \\ & & & Z \\ X & \text{'Scale,CR'&MS,} & \end{array} \right) + \epsilon_6$$

$$P_D = f_3 \left(\begin{array}{cccc} \geq 0 & \geq 0 & \leq 0 & \leq 0 \\ & & & Z \\ X & \text{'Scale,CR'&MS,} & \end{array} \right) + \epsilon_7$$

Observe that these equations are very similar to the equations underlying the RE model. The main difference is that the market structure models show a direct link between prices and structure. The SCP paradigm states that there is a positive relationship between profit and CR and between loan prices and CR (deposit prices will always have the reverse signs on variables as loan prices). The RMP paradigm on the other hand states that the driving variable is the market share MS. Note also that there is a role here for the efficiencies, as the existence of noncompetitive behaviour does not preclude price and profit differentiation via the relative efficiency of firms. Another distinction between the RMP/SCP models and the RE models is the nonexistence of a causal relationship. In fact, we may introduce a version of Hicks 1935 Quiet Life (QL) Hypothesis, where firms subsume some of the realizable gains from greater efficiency into expense preference behaviour or other forms of relaxing the strict profit maximizing assumptions. This has the formulaic representation as:

$$X = f \left(\begin{array}{cc} \leq 0 & \leq 0 \\ & Z \\ \text{CR}'\text{MS}' & \end{array} \right) .$$

What this implies is that there will be a negative relationship between efficiency and the market structure variables. Higher degrees of efficiency will be found in markets with lower concentration and in firms with smaller market share. Caves and Barton (1990) indicate in their survey that this QL behaviour may well be a dominant paradigm in certain sectors of US manufacturing industry. For evidence on the expense preference issue, where there is evidence of managerial discretion allowing expenses under their direct control to rise rather than minimizing cost, Mester (1989) on US Savings and Loans, and Hannan and Mavinga (1980) on banks are useful examples in the financial services area.

Some Retrospection

Gilbert (1984) provided a major study of the entire SCP literature to that date. A few stylized facts from the work of Gilbert would include the fact that as of the time of his article, there was an inadequate theoretical foundation in the SCP literature. As already mentioned, this has been rectified to a certain extent by the work of Hannan (1991), who explicitly derives the SCP foundation from microeconomic theory. This is crucially dependent in its inception on the assumption of the bank as a price taker in the securities market, which is probably not too strong an assumption. He derives the fact that the regressions should include a term showing the interaction of concentration and market share, with coefficient opposite in sign to that predicted for market share and for concentration, in regression of prices and market variables. In the case of profitability, defined in his analysis as Return on Assets, he shows that a measure of loan market rather than deposit market concentration levels should be used.

Prices are not an appropriate measure of performance but profits are. This arises from the fact that typically in the literature, prices are averages over a number of time periods of the income or cost associated with a product, but the denominator that converts these flows into prices is a balance sheet stock element. In summary, of 44 studies looked at by Gilbert, in 25 there was found some evidence to support the SCP paradigm. However, many of these studies were poorly motivated and plagued by measurement and theoretical error. The better studies in terms of statistical and methodological sophistication tended to show greater evidence for the SCP paradigm than the poorer studies.

As already mentioned, a theoretical foundation was given explicitly by Hannan. Importantly, he gave a number of pointers towards the appropriate empirical specification. Firstly, the theoretical foundation implies that an analysis should be undertaken as between the loan and deposit market. However, the effects measured will be smaller in the loan market than in the deposit market. Accordingly, any analysis that finds evidence for the loan market will encompass the deposit market results. For this reason, I have decided to use the loan market concentration and Herfindal indices for banks. Second, the capital/asset ratio and the ratio of fixed costs to asset size are important potential explanatory variables. Unfortunately, the data for the Irish banking sector does not allow such to be taken across all banks.

Other studies that have looked at the area include Evanoff & Fortier (1988) and Berger & Hannan (1993) and Lloyd-Williams et al (1994). Evanoff & Fortier were motivated by a desire to look at the RE versus the SCP/RMP paradigms, from the perspective of providing guidance to antitrust legislators. The US antitrust legislation, they argue, would be counterproductive if the SCP/RMP paradigm was in fact not the correct description of the market – as was assumed to be the case. If in fact the RE paradigm tended to explain the market better, then antitrust legislation would promote less efficiency rather than greater. They looked at data for 6,300 banks in 30 US States for 1984, and noted that the two theoretical bases are not exclusive and are possibly complementary. One potential problem with the study however is that they do not look explicitly at efficiency, instead choosing to look at various regulatory effects which are hypothesized to reduce efficiency. From this analysis, they conclude that the RE paradigm is superior to the SCP/RMP paradigms. However, this is not definite, as we have seen that the microeconomic foundations of the various competing models indicate that the firms specific efficiencies are the important elements rather than the externally imposed regulatory barriers, which would be part of the vector of alternative explanatory variables, Z.

By contrast to Evanoff & Fortier, Berger & Hannan studied a wider range of possibilities. They included explicitly calculated estimates of scale and X efficiency, and looked at all four possible paradigms under both price and profit measures. The study encompassed 240 banks for 1985. A general feature of such studies is that there is typically a substantial lag between the period for when the data relate and the

publication date for the paper. Looking at the survey tables in Gilbert, it is clear that the average lag is 5 years, with some studies lagging by as much as 12 and others as little as 2 years. The findings of Berger & Hannan indicate that for price data, the traditional SCP paradigm is strongly supported. As an adjunct, the QL hypothesis is found to exist, a negative relationship being found between efficiency and concentration. For profitability however, the SCP is not strongly supported. The RMP and RE paradigms are not supported by the data. For the profit relationships, market share was positive but not so in the pricing models. While the measures of X and scale efficiency were positively associated with profit, they did not appear to be related to prices at all. more worrisome, the market share measures were not positively associated with the efficiency measures, a necessary condition for the RE paradigm to be accepted. Greater efficiency is not found in more concentrated markets or in firms with greater market power as measured by market share.

A recent study on European bank profitability is that undertaken by Molyneux and Thornton (1992). This paper looked at the pan-European situation, using data from the IBCA database. They found, in common with the results found by Bourke (1989), that there was a positive, statistically significant relationship between concentration and various measures of profitability. In addition, some evidence is found of expense preference behaviour. This result should not be taken as holding for Ireland however, as the database used has many shortcomings for the Irish banks included in it. In particular, there are not the data in the IBCA database to allow for the expense preference behaviour to be tested for Ireland. In addition, the concentration ration used was the 10 bank concentration ratio which would be close to meaningless for Ireland. Accordingly, this result, while interesting, is not necessarily expected to be replicated.

The most recent contribution to this literature, in the European context, is that by Lloyd-Williams et al (1994). They undertake an analysis, as this paper does, of the RE versus the SCP paradigms, in the context of a study of 140 Spanish banks for the years 1986 to 1988. However, in common with the Evanoff and Fortier work, this paper looks at the relative efficiencies as being manifested in the form of an instrumental variable – in this case the market share variable. As we have seen above, if there truly are firm specific differences operating in the efficiency realm, then directly including them in an analysis, along the lines of Berger & Hannan, should allow these measures to pick up the influences that otherwise might be coalesced with the market share or concentration ratio measures. After all, it is as a result of these efficiencies, so the paradigm states, that the structure of the market is as it is. Using this methodology, Lloyd-Williams et al find evidence in favour of the traditional SCP paradigm, with the results for both pooled and annual samples yielding similar results.

Data and Measures in this Study

For banks in Ireland cost information is not available as standard, and as a consequence only profit, staff numbers and information on investments held, deposits accepted and

loans issued are available. A richer data set is available for building societies. Also, it is impossible to obtain publicly held data on the prices charged by financial institutions to their clients. Accordingly, the interesting area of price analysis cannot be followed through this paper. The time period analysed for banks was 1988–1993, and for building societies 1987–1993. For the banks and for the building societies, a market share variable was constructed. For both, a Herfindal index was constructed – a three firm concentration ratio was constructed for the banks but not for the building societies. In addition, the percentage of the market held in each of the years by each institution was used.

The measures of efficiency in this study are twofold. In the case of both banks and building societies, the method of the Free Disposable Hull (FDH) is used to provide a metric of relative efficiency. This is a Non Parametric Method of assessing efficiency, and is not capable of distinguishing between the scale and x effects. However, as we have noted, the X effects, technical and allocative, are expected to dominate any scale issues. A useful reference to Free Disposable Hull analysis is the work of Vanden Eeckhaut et al (1993).

A unit is said to be cost (revenue) efficient if it is dominated by another unit. Domination implies that the costs (revenue) are lower (higher) and the output is higher in the dominating unit. If a unit is undominated it is measured as fully efficient. The degree of inefficiency is measured by the ratio of the cost (revenue) of the unit under examination and that of the most dominating unit, that is the unit which has the lowest (highest) cost (revenue). The advantage of this is that it requires no distributional assumptions regarding the efficiency measures and can be used in circumstances such as here where there are not cost functions available for all units. It also relaxes the issue of convexity, and allows locally non-convex frontiers. Additionally, it requires only weak disposability, i.e. that an increase in output requires at least no reduction in inputs. More formally, we may see FDH as a mixed integer linear programming method, which fortunately does not require complex methods of estimation for its solution. A FDH envelopes the data more closely than other programming methods of analysis, allowing for the efficient frontier to be composed only of realised production technologies.

For building societies only, the metric of distribution free efficiency is used as an alternative to the FDH metric. This method was popularized in the finance literature by Berger (1992). Again, similar to the FDH analysis, the basic idea is that inefficiency is to a relative concept, not an absolute. However, the assumption required here is that inefficiencies are time invariant, but firm specific. While this may be an uncontroversial assumption for a relatively short time period, such as here, where data are analysed over the period 1987–1993, as the depth of the panel (time) increases the assumption surely becomes less and less so.¹ The need for a specific distribution of the inefficiency into technical and allocative terms is avoided, but the individual elements are not separable. The process starts with an estimation of a Translog cost-share system, which then yields residuals for each firm in each period. These are then averaged by firm to yield a firm

specific average. The firm with the minimum average residual, is then used as the reference firm. The efficiency measure then is how much cost could be reduced (or production increased) per firm relative to the reference firm. This yields a measure of efficiency. A related technique includes firm specific dummies in the equation and these replace the averages of residuals. Unfortunately, any non-time invariant variables must first be removed from the data set, and the influence of these is then picked up by the firm dummies. Tests have shown that this is not as efficient as the previous technique. In the case of the data here, a simple translog cost function was analysed, as addition of the cost shares has been shown not to add greatly to the estimation accuracy. More seriously, imposition of a SUR estimation, including the cost shares in the analysis, would force the assumption that all the x efficiencies were technical in nature, resulting from the overuse of inputs, as opposed to allocative. Using OLS alone does not require one to specify any mix of allocative and technical inefficiencies. Finally, as a practical point, data on the costs of individual elements were not available. Standard homogeneity and symmetry conditions were imposed on the translog.

What do the results tell us ?

Table 1 shows the details of the regression results for both building societies and for banks. I have decided to concentrate on the loan market, for the reasons given in Hannan (1991), and accordingly the concentration and market share ratios are for that market. The degree of explanatory power is relatively low, ranging from 3% to 30%. This spans the range of R2 results typically found in this area, with the exception of some of the annual analyses of Lloyd-Williams *et al.*

Looking first at the banking market, there is significant additional explanatory power when the efficiency data are included in the analysis. Second, the efficiency data are of the correct sign and are significant. Third, there does not appear to be any significance in the market structure or relative market power variables. Also, these switch in sign from the expected positive sign to a negative sign when the efficiency data are included as explanatory variables. This is evidence against the simple RMP/SCP paradigms working here. The correct signing and high significance of the efficiency metric, combined with the lack of power in the other variables, indicates that the RE paradigm is at least a possible explanatory theory for the Irish banking market.

For Building Societies, the points made for the banking market broadly hold true. Inclusion of efficiency data does increase the explanatory power of the regressions, but here the signs on the efficiency coefficients are negative, contrary to the predictions of the RE paradigm. Data for Irish and Branches do not appear in the analysis of building societies for the reason that all the building societies bar one are Irish and also for the fact that the network of building society offices comprises both branches and agencies. While details on the number of branches is available, agency numbers are more difficult to enumerate. We see again that there is little in the way of explanatory power from the

Table 1: Testing the SCP and RE Paradigms for Irish Credit Institutions

	<i>Banks</i>				<i>Building Societies</i>		
<i>Constant</i>	0.0313 <i>0.36</i>	-0.0023 <i>-0.02</i>	0.1086 <i>1.55</i>	0.1091 <i>1.34</i>	-1.5080 <i>-1.31</i>	-1.6390 <i>-1.50</i>	-1.5310 <i>-1.47</i>
<i>Market Share</i>	0.0096 <i>0.40</i>		-0.0081 <i>-0.42</i>		-0.0126* <i>-1.71</i>	-0.0105 <i>-1.48</i>	-0.0036 <i>-0.49</i>
<i>Herfindal Index</i>		0.0186 <i>0.45</i>		-0.0086 <i>-0.26</i>	0.08 <i>1.26</i>	0.1113* <i>1.88</i>	0.0789* <i>1.44</i>
<i>3 Firm Concentration Ratio</i>	0.0005 <i>0.04</i>		-0.0037 <i>-0.33</i>				
<i>Year</i>	-0.0002 <i>-0.28</i>	0.0001 <i>0.06</i>	-0.0013 <i>-0.18</i>	-0.0013 <i>-1.57</i>	0.0008 <i>1.31</i>	0.0009 <i>1.56</i>	0.0008 <i>1.48</i>
<i>Number of Branches</i>	0 <i>-0.71</i>	0 <i>-0.74</i>	0 <i>-0.83</i>	0 <i>-0.78</i>			
<i>Irish Owned</i>	0.0313 <i>0.36</i>	-0.0003 <i>-0.11</i>	0.0036* <i>1.64</i>	0.0036* <i>1.64</i>			
<i>FDH Efficiency Metric</i>			0.0227*** <i>5.80</i>	0.0228*** <i>5.76</i>		-0.0772** <i>-2.34</i>	
<i>Distribution Free Efficiency Metric</i>							-0.0179*** <i>-3.08</i>
<i>R Squared</i>	0.038	0.042	0.411	0.411	0.117	0.231**	0.297***
<i>F Stat</i>	0.43	0.47	6.17***	6.16***	1.88	2.77	3.91
<i>N Obs</i>	60	60	60	60	42	42	42

T Statistics are in Italics.

* = Significant at 10%

** = Significant at 5%

*** = Significant at 1%

market share variable, which is also perverse in sign. The H index, used as there are only 6 companies being analysed, is positive and significant only when taken with the efficiency measures. These, however, are negatively related to the profitability measures, contrary to expectations. However, we note that the efficiency variables are negative and reasonably significant. This indicates that the quiet life variant of the SCP paradigm may be in action. To check this possibility, a regression of the efficiencies was run on the structural variables:

$$\text{DISTFRE} = 0.626 + 0.506 \text{MSMORT}^* + 0.09 \text{HMORT} \quad R^2 = .084 \quad F = 1.78$$

$$\text{FDHB} = 0.894 + 0.0274 \text{MSMORT}^{***} + 0.369 \text{HMORT} \quad R^2 = .162 \quad F = 3.77^{***}$$

Crucially, the signs on the market structural variables are positive, in violation of the predictions of theory. This indicates that, contrary to what has been seen in Table 2 [not provided – will be asked for at the proof stage] there is a positive relationship between efficiency and greater concentration. Clearly, the Quiet Life hypothesis is not an adequate explanation of the results seen above for building societies.

Conclusion

We have seen here some very preliminary evidence regarding the industrial economics of the Irish banking and building society system. Two competing theories have been directly tested by the inclusion of explicitly calculated efficiency ratios in the analysis. This indicates that the simple Structure-Conduct-Performance paradigm does not hold in either the banking or the building society market. For banks, there is evidence that the Relative Efficiency paradigm is an adequate explanation of returns on assets, but the evidence is mixed for the building society sector, where some evidence regarding the quiet life variant of the SCP paradigms found, but there are paradoxical results.

The evidence here, while preliminary, is consistent with much of the literature from other countries. In particular, it is in line with the evidence found in Berger & Hannan (1993) and is not inconsistent with the results found in Evanoff & Fortier (1988). It is clear, however, that there is a great deal of work still to be done. Three avenues await exploration. The first is the integration of the data sets into a total credit market analysis. This would have the implication of a re-evaluation of the efficiency measures, as there is differential data quality. The second is the issue of alternative additional/alternative explanatory variables to the one included. The third is the issue of improvements in data quality, particularly in the case of banks.

Note

- 1 The only exception to this would be where the market is in long-term equilibrium. This is not so in the Building Society market, as shown by the fact that the H statistic of Ross and Panzar, which takes the value of 0 if the market is in equilibrium is here -2.3, indicating substantial disequilibrium.

Banks in the Study: ACC, Allied Irish, Anglo Irish, Ansbacher, Bank of Ireland, Cork and Limerick Savings Bank, Trustee Savings Bank Dublin, ICC, Irish Intercontinental, National Irish, Woodchester Investments. All data for fiscal year end 1988–1993. On average this data set contains over 90% of assets of Irish licensed banks.

Building Societies in the Study: Educational, First National, Irish Civil Service, Irish Nationwide, Irish Permanent, Norwich Irish. All data for year end 1987–1993. On average this data set contains over 98% of assets of Irish building societies.

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