THE GEOGRAPHIC EXTENT OF UK RETAIL BANKING MARKETS

by

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Abstract

This study examines the geographical extent of UK markets for retail banking services, which are provided through the branch networks of UK depository institutions. The research draws from previous UK work in its emphasis on defining markets with respect to the all the providers of a broadly homogeneous product or service rather than as a collection of similar institutions. Using a testing procedure adapted from the US antitrust literature, statistical evidence is presented indicating a significant local market influence for some instant access deposit values and the mortgage market. Evidence indicates the source of local market characteristics appears to be related to the type of depository institution which provides banking services through branch networks.

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1. Introduction

Market definition is an increasingly important area for academic and policy investigation due to an assortment of legal and political reasons. The legal demands for market definition have altered substantially in the last decade. The largest change in the legal rationale for defining markets in English and Welsh law has occurred with the movement towards greater convergence with European practice on defining markets. It has been interpreted under European competition law that a market must be defined before a conclusion as to the market position of a firm or firms may be reached. Thus for a dominant position to be found a market definition must be provided.

The political background over which these legal changes have been enacted has changed. During the last decade, increasing concerns as to the competitiveness of the national economies have led governments increasingly to intervene in markets where competition is viewed to be insufficient (Utton 2000). A decisive move towards this goal in the UK has been the introduction of the Competition Act (1998). This development together with the introduction of the Enterprise Act (2000) has increased the responsibility and criminal liability of firms which are deemed to be uncompetitive. This criminalisation of competition assessment will inevitably increase the importance of developing a clearer assessment of competition and by implication market definition as the measure of proof demanded by competition assessment becomes more stringent.

The specification of the geographical parameters of markets is therefore an important initial decision which is required within any assessment of competition. These concerns as to the importance of employing appropriate market boundaries have also long challenged academics. Chamberlin (1950) in advising care when defining markets indicated that 'Industry' or 'Commodity' boundaries are a "snare and a delusion – in the highest degree arbitrarily drawn, and, whenever drawn, establishing at once wholly false implications … as to competition of substitutes within their limits, which supposedly stops at their borders,". A central issue influencing these decisions is that a poor market definition may either exaggerate or underestimate the extent of competitiveness problems. Such a perspective has also been developed by others who echo such concerns as to the practice of geographical market definition. Stigler (1982) compared this process of market definition to "economic gerrymandering" where

the prime objective of such an exercise was to convince the appropriate authorities that concentration ratios will be substantial or insignificant depending on the specific interest of the commentator. Thus, considering too narrow or too broad a market, would lead to an under and over estimate of the level of market power exercised by incumbent firms, respectively. This viewpoint has gained increasing recognition among many commentators. Geroski and Griffith (2003) state "Market identification is important because the computation of market shares matters in anti-trust cases, and this is so for at least two reasons. First market shares are used to help establish jurisdiction or more generally to sort out priorities for anti trust agencies .. secondly, market shares are sometimes used as an observable measure of market power, meaning that the fact of finding high market shares is sometimes taken to be tantamount to uncovering the existence of market power."

To summarise, when assessing competition within a market, the importance of correctly defining the boundaries of that market is paramount. While the concept of the market is used widely in government policy, law and economics, issues associated with correctly defining the appropriate market in geographical terms have been often been overlooked in the wider academic literature. It is proposed that the continuing re-regulation of industrial and commercial sectors in terms of the content and practice of competition law demands a greater understanding of the extent and definition of markets to direct policy and foster greater competition and economic efficiency. In the study this research question will be explored for retail banking services.

To address the research question of whether national markets exist for retail banking services, the paper will be divided into five sections. In section 2, the research background will be outlined with a description of academic and regulatory literature pertinent to this study. The origins and characteristics of the data set employed in the study will be discussed in section 3. In section 4, the model adapted from the US antitrust literature (Biehl, 2002, Stigler and Sherwin, 1985) will be outlined, applied and the results discussed. Lastly, in section 5, conclusions will be drawn with specific emphasis on the policy implications of the research results for measuring competition within UK retail banking markets together with suggestions for further research.

2. The Research Background

It may appear strange to suggest that the pricing of many UK retail banking services are geographically dispersed, when interest rates are set centrally by banks for all their outlets in the UK. Further it is assumed by classical economic theory that under conditions of rationality and perfect information differences in interest rates would be bid away by arbitrageurs. This normative view has a degree of support with many commentators who pragmatically suggest that significant interest rate differentials between similar products are not really sustainable in the longer term. Consequently, a common practice in many academic studies is to assume that such a relatively small geographical space as the UK, must be unified. This assumption is common despite substantial evidence that prices or interest rates do not clear in many banking markets (Stiglitz and Weiss 1981). Following this perspective, most previous UK and European academic studies of banking competition (Heffernan, 2002, Corvoisier and Groop 2002), and regulatory work (Cruickshank 2000, Competition Commission 2001) has explicitly assumed that UK and European banking markets are national in form.

While retail banks do set single or uniform interest rates over entire physical distribution networks, few banks have a complete coverage of all areas of the UK. Under such circumstances, individual customers across the UK could be faced by geographical variation in interest rate setting, as different UK areas are home to different collections of retail banking branches. Equally, variation in interest rates can be compounded and potentially exaggerated by consumers in two ways. Firstly, the distance which an individual would be prepared to travel for the purchase of a retail banking service generally extends over only a portion of the national market. Due to this limited propensity to travel for banking services, many customers will only have access to a limited array of 'nationally distributed' banking products. Secondly, this position of limited branch coverage is exaggerated if consumers play an important part in determining the level of competition through searching for the best interest rate for a banking service. If a market is widely perceived to be competitive many customers will not actively search for the lowest price allowing interest rates differentials to emerge between banks (Waterson, 2003).

Under such influences the variation of interest rates of retail banking products and services across the UK, be these set nationally or not, becomes an issue of bias when defining the geographical scope of markets. If the range of interest rates of banking services offered in different regions of the UK is systematically different, location is seen to have an influence on the realised price set by firms.

2.1 The Academic Literature

There have been only a limited number of studies of market definition in the UK or European banking markets. This lack of interest perhaps lies in the form of uniform pricing policies and national scope of many depository institutions in European countries; for example, a recent report as to the competitive environment of UK banking (Cruickshank 2000) rejects the possibility of local and regional markets as UK banking markets are viewed to be defined in terms of product characteristics alone. In a similar vein, a contemporary competition or antitrust enquiry into the potential effects of a merger between two large UK retail banks (Competition Commission 2001) indicated, "… Most of those providing evidence suggested there was a national market (for banking services) referring in particular to uniform pricing across geographical regions". Equally, many academic studies have assumed UK banking markets must be national in scope due to the uniform pricing structures adopted throughout the UK banking industry. On this issue Heffernan (2002) states "…. unlike the US but similar to Canada, UK retail banking is a national market, where deposit and loan rates quoted to customers by a given bank or building society apply across the country".

Other evidence indicates banking markets are not national. The Competition Commission (2002) in an assessment of competition in the UK market for banking services offered to small to medium sized enterprises (SME), states the "… existence of national prices does not necessarily mean that there are no local markets …. The absence of major price differences would not necessarily constitute evidence that there is a single market; it might reflect similar local markets behaving in similar ways". An early academic study which has considered the possibility of geographically based interest differentials for the UK was provided by McKillop and Hutchinson (1990), who indicate that interest rates of loans for small enterprises are higher in Northern Ireland. Developing this perspective, Ashton (2001) considers whether variation of retail deposit

interest rates is similar across the UK. This test for a unified economic market, based on the law of one price, uses monthly interest rate data for the UK deposit market from 1999, for 83 depository institutions covering 290 deposit products. This study indicates that significant differences in the variance of retail deposit interest rates exists, a specific violation of the law of one price contradicting the existence of a unified economic market for UK retail deposit accounts.

Most studies of banking market definition have considered US markets, which have significant regulatory differences from UK banking markets. The rationale for most of the US studies has been both the continuing merger movement of US depository institutions and the future competitiveness of deregulated US banking markets. A central issue in the deregulation debate has been the effect on market definition of the movement away from unit banking based around a single bank branch to multi branch banking, where a network of bank branches is formed around individual banks. Within such branch networks the increasing use of uniform, as opposed to local pricing policies, has also been a point of particular interest.

In assessment of these issues a rich US literature has developed to quantify the geographical extent of banking markets. Jackson (1992) uses econometric time series techniques to test whether a national market exists in the US banking industry and whether the US definition of the banking 'product' is too broad. Through employing bank-specific interest rate data for three types of deposit services, Jackson reports that time deposit accounts display national market characteristics, whilst other deposit accounts, such as instant access deposit accounts, display more local market characteristics. Redescki (1998) employing deposit interest rates and concentration measures arrives at broadly similar conclusions, using a different data set. In turn, the work by Redescki (1998) has been criticised and reassessed by Heitfield (1999), who provides results consistent with smaller geographic deposit markets.

Bielh (2002) develops this literature by considering the geographical scope of markets using a panel data set of bank deposit rates for New York State. He maintains that as "… deposit rates are statistically different across institutions operating in the same city", other factors beyond geography may have a strong influence on the setting of interest rates. Thus local characteristics

of bank markets appear to be driven by small depository institutions with a more local focus of operation, while large banks operating branches in a number of markets may have interest rate setting policies which relate to wider geographical areas. This study also provides partial explanation of other studies which have indicated that a national market exists for US banking services. For example Jackson and Eisenbeis (1997) used a cointegration analysis to test for market integration of deposit interest rates over the period 1983 to 1984. In defining their sample Jackson and Eisenbeis chose the 3 largest banks in each of 29 distinct metropolitan areas, providing a large bank bias in sample selection. These findings are consistent with the findings of Biehl (2002) which indicates larger firms serve wider geographical areas, as the presence of local markets is rejected for 90 per cent of the metropolitan markets considered.

3. The Data Set

The interest rate data used in the study were developed from the Moneyfacts magazine, which publishes a detailed monthly survey of monthly banking prices and charges for UK depository institutions, which provide banking services across all areas in the UK. This monthly data has also been used by the number of UK government reports (Competition Commission 2002, Cruickshank 2000). In common with other academic work, this study is limited to considering price or interest rate data to describe market definition due to the acute difficulties in obtaining accurate quantity data on a firm by firm basis.

Firm specific interest rate data used in the study are provided daily from 1st January 1995 to the 31st December 2000 for two product groups: instant access deposit accounts and residential mortgages. These banking services are used as they are both involved in the key retail banking processes of saving and borrowing, and are provided and used by a large number of suppliers and customers respectively. The sample for instant access deposit accounts includes a single account offered by 66 depository institutions which have supplied these services in a consistent form, continuously over the sample period. Interest rates for instant access deposit products are provided for four interest rate tiers or deposit levels (£500, £1000, £5000, £10,000) [which correspond to the amounts deposited], and are consistent with the data released by the

Moneyfacts magazine and the suppliers themselves. The sample for the mortgage interest rates used in this study is taken from 77 retail banks and building societies, which have operated continuously over the sample period. Mortgage interest rates are firm specific reference rates from which other differentiated mortgage contracts, such as endowment mortgages and different types of repayment mortgages, are priced. Two reference interest rates for mortgages are employed for existing and new borrowers. Product characteristics are not included in the study, which places emphasis on the similarity and dissimilarity between firm specific interest rates, not the values of interest rates themselves.

The geographical dispersion of depository institutions offering banking services is made with reference to the distribution of the physical branch network. To provide an indication of the geographical distribution of branches for individual banks and building societies across the different regions of the UK, the 123 UK postcodes were employed. Post code areas are employed in this study as it is assumed that as most bank customers have a strong preference to use their local bank or building society branch (Kiser 2002, Kwast *et al* 1998, Cruickshank, 2000) and post code areas provide an adequate description of an area beyond which a bank customer would not be prepared to travel for access to bank branch.

The distribution of bank branches across the UK is recorded by quantifying which banks have a presence in each of the 123 postcode areas. The branch location data was collated both with reference to the Building Societies Year Book and individual retail banks, for 1999. While it is conceded that the scale of individual branch networks has altered over the sample period 1995-2000, the geographical coverage by individual institutions within postcode areas is not thought to have shifted significantly over the sample period (see Ashton, 2001 and Marshall *et al*, 2000).

It is acknowledged that many of these banking products are distributed through intermediaries, telephone call centres and across the internet. Previous research has clearly displayed that while retail banking services are distributed through different channels both interest rate setting behaviour and the values of interest rates for banking products issued through different channels do not differ significantly (Ashton 2003). The decision to consider only branch distributed products is justified as it is assumed that the physical branch network remains an important point

of contact between the customer and the depository institution. Many customers still prefer to research their banking services purchases through a physical outlet, even if just for advice on how to proceed with a telephone or internet application. On this subject, the Competition Commission (2001) stated "… branches remain important to customers; it was suggested to us that this was more the ability to discuss problems in person than for the ability to make branch based transactions".

4. The Testing Procedure

The standard test used by most European competition or anti-trust authorities to define markets is the SNNIP or hypothetical monopolist test which illustrates the effects of a (hypothetical) Small but Significant Non-transitory Increase in Price on the profitability of the (hypothetical) firm that makes a price change. Despite its widespread advocacy as a test for market definition purposes, major failings of this test are "…. its hypothetical nature and gathering the information needed to put it into practice" where a "… critical feature of the SNNIP test is that it is almost always the case that one cannot directly observe a SSNIP test in operation" (Geroski and Griffith 2003). To accommodate these failings it is deemed important to observe the features represented by the specification of this test (Geroski and Griffith and OFT 2001), where this test can be seen as an evaluation of both the reaction of firms to a price change by competitors and consequent influences on product demand, rather than a test of the law of one price or an assessment of a strictly economic market.

To achieve this goal an approach previously applied in the US antitrust literature (Stigler and Sherwin, 1985 and Biehl, 2002) is adapted. The basis of this approach is the assessment of how interest rates in similar markets move together. It is proposed that retail interest rates change in response to a range of external shocks such a movement in the underlying central bank base rate. To test directly for the reaction of depository institutions to an interest rate change by a competitor, measurement of the degree of similarity and dissimilarity between different pairs of daily interest rates issued by different depository institutions is made. This testing procedure assumes that depository institutions operating in regional or local markets should react to

external shocks in a relatively similar way to other depository institutions operating in the same regional market. This procedure for market definition is therefore a one-way test for measuring if larger market areas can be rejected. Conversely, if a unified national market does exist, interest rates offered by banks and building societies operating within different postcode areas should move together in a random fashion.

The testing procedure was undertaken in a number of distinct steps. Initially both Pearsons correlation coefficients and squared Euclidian distances were estimated for pairs of interest rate observations for the banking services offered by different depository institutions. Both these measures of similarity and dissimilarity, respectively, were estimated to represent aspects of association between two variables, including the linear relationship between two variables central to the Pearsons correlation coefficient and the magnitude of dissimilarity between two variables expressed by squared Euclidian distance. Secondly, the distribution of the branch networks is codified by recording within the postcode areas which both the depository institutions have a branch presence as a percentage of all postcode areas. This measure of the extent of geographically shared operations or market overlap (*Overlap*) is employed to provide an indication of how geographically linked are the pairs of depository institutions in terms of the location of their branch networks. Lastly, a regression model is estimated, which will be used to test if the degree of geographic market overlap is a significant determinant of the level of similarity and dissimilarity between pairs of interest rate observations. The model can be written as:

$$A_{ij} = \alpha + \beta_{ij} Overlap \quad + \varepsilon \qquad (1)$$

where α and β are both coefficients to be estimated and A_{ij} is the measure of similarity or dissimilarity between depository institution i and depository institution j ($i \neq j$).

This regression model is estimated using an Ordinary Least Squares procedure for the four different interest rates for different values deposited in instant access deposit accounts and the two mortgage reference rates. Additionally, the model is estimated for three different samples of similarity and dissimilarity statistics, including a) all pairs of depository institutions, b) pairs of

local and regionally based institutions which both have 25 per cent or less coverage of all UK post code areas, and c) pairs of nationally based depository institutions which both have a branch network presence in more than 50 per cent of UK post code areas. This sample division of the sample is made to test for possible differential pricing behaviour of depository institutions with different degrees of market coverage. If a unified national market for retail banking exists, the coefficient estimates for the *Overlap* variable should be insignificant or negative for the Pearsons correlation coefficient (a measure of similarity) and be insignificant or positive for the squared Euclidian distance (a measure of dissimilarity). If regional markets do exist in the UK retail banking market then positive and significant coefficient estimates should exist for the *Overlap* variable when using the Pearsons correlation coefficient and be significant and negative for squared Euclidian distance.

Descriptive statistics of the average measure and dispersion of similarity and dissimilarity statistics for the three samples of depository institutions are contained in Table 1. From this table it can be inferred that on both substantial congruence exists between the two measures of similarity and dissimilarity representing magnitude of differences and linear fit of pairs of interest rate observations. On average there is a relatively higher level of similarity and lower level of dissimilarity between mortgage rates, than exist for deposit accounts. Equally substantial differences also exist in the degree of similarity of distinct levels of deposits. For example, interest rates for £1000 deposited displays lower degree of similarity and higher degree of dissimilarity than other sums deposited. This finding indicates that interest rates for different amounts deposited may differ due to factors other than the cost of borrowed funds.

4.2 Results

The estimates from the regression model are reported in Table 2 for Pearsons correlation coefficients and in Table 3 for squared Euclidian distances. The level of model fit is low for all regression models estimated, indicating that factors other than local and regional markets play a substantial role in determining the association between interest rate values. The results produced using Pearsons correlation coefficient and squared Euclidian distance display similarities in terms of which coefficients are identified as positive and negative and as significant, indicating our results are consistent both for the linear fit and magnitude aspects of association. Equally,

with reference to the model presented by Biehl (2002) the degree to which local and regional markets influence the interest rate setting of UK depository institutions is far less than has been observed in the USA.

Table 1: Descriptive Statistics

Geographic Scope	Interest Rate	Number of Observations	Mean Pearsons CC	Standard Deviation Pearsons CC	Average Squared Euclidian Distance	Standard Deviation Squared Euclidian Distance
Deposits						
Overall. All pairs of depository institutions included	£500	1711	0.8428	0.1057	968.59	1447.05
	£1000	1891	0.7629	0.2286	281.98	481.42
	£5000	1953	0.8322	0.1308	3614.93	3952.32
	£10000	1953	0.8392	0.1476	3316.59	3504.61
Regional and locally based depository institutions	£500	946	0.8521	0.1025	1082.92	1628.33
	£1000	980	0.8014	0.2013	250.25	459.04
	£5000	1028	0.8463	0.1179	3095.18	3654.79
	£10000	1028	0.8524	0.1492	2856.83	3451.71
Nationally based depository institutions	£500	55	0.8531	0.1050	357.71	502.94
	£1000	66	0.8268	0.1009	127.15	143.41
	£5000	66	0.8653	0.0782	2578.86	2123.73
	£10000	66	0.8686	0.0848	2258.90	1585.05
Mortgages						
Overall. All pairs of depository institutions included	New borrower rate	2775	0.95278	0.023743	196.3846	216.2052
	Existing borrower rate	2775	0.95278	0.02165	197.3987	217.5692
Regional and locally based depository institutions	New borrower rate	1338	0.956807	0.018348	195.8695	235.0908
	Existing borrower rate	1338	0.954787	0.018273	201.1868	235.5999
Nationally based depository institutions	New borrower rate	103	0.950562	0.033019	195.6889	171.3925
	Existing borrower rate	103	0.961202	0.024361	174.0437	175.2419

Table 2: Regression Results and Diagnostics using Pearsons correlation coefficient

Geographic Scope	Interest Rate	R^2	F Test	Constant (Standard Error)	Overlap Coefficient (Standard Error)
Deposits					
Overall. All pairs of depository institutions included	£500	0.020	3.244	0.715 (0.007)**	0.00726 (0.000)*
	£1000	0.000	0.155	0.760 (0.006)**	0.00013 (0.000)
	£5000	0.000	0.598	0.831 (0.003)**	0.000147 (0.000)
	£10000	0.001	1.721	0.838 (0.004)**	0.00028 (0.000)
Regional and locally based depository institutions	£500	0.001	1.160	0.745 (0.008)**	0.00104 (0.001)
	£1000	0.000	0.321	0.801 (0.007)**	0.00044 (0.001)
	£5000	0.000	0.042	0.846 (0.004)**	-0.00005 (0.000)
	£10000	0.000	0.068	0.852 (0.005)**	0.000151 (0.001)
Nationally based depository institutions	£500	0.275	20.108**	0.694 (0.028)**	0.00186 (0.000)**
	£1000	0.233	19.467**	0.727 (0.025)**	0.00162 (0.000)**
	£5000	0.344	33.520**	0.771 (0.018)**	0.00152 (0.000)**
	£10000	0.347	33.981**	0.766 (0.020)**	0.00166 (0.000)**
Mortgages					
Overall. All pairs of depository institutions included	New borrower rate	0.004	12.204**	0.952 (0.000)**	0.00105 (0.000)**
	Existing borrower rate	0.005	15.064**	0.952 (0.000)**	0.00106 (0.000)**
Regional and locally based depository institutions	New borrower rate	0.007	9.944**	0.956 (0.00)**	0.002187 (0.001)**
	Existing borrower rate	0.010	13.154**	0.954 (0.001)**	0.002502 (0.0007)**
Nationally based depository institutions	New borrower rate	0.104	11.752**	0.937 (0.005)**	0.00284 (0.000)**
	Existing borrower rate	0.004	0.434	0.963 (0.004)**	0.000425 (0.000)

** = Significant at 5%, * = Significant at 10%

Table 3: Regression Results and Diagnostics using Squared Euclidian Distance

Geographic Scope	Interest Rate	R^2	F Test	Constant (Standard Error)	Overlap Coefficient (Standard Error)
Deposits					
Overall. All pairs of depository institutions included	£500	0.006	9.872**	1001.703 (37.046)**	-7.138 (2.272)*
	£1000	0.000	0.652	285.275 (11.801)**	-0.564 (0.699)
	£5000	0.000	0.771	3643.40 (95.135)**	-5.027 (5.725)
	£10000	0.002	4.18*	3375.32 (84.285)**	-10.37 (5.072)**
Regional and locally based depository institutions	£500	0.000	0.362	1089.616 (54.116)**	-3.800 (6.316)
	£1000	0.000	0.469	252.311 (14.973)**	-1.218 (1.780)
	£5000	0.002	2.563	3131.866 (116.186)**	-22.630 (14.136)
	£10000	0.003	3.402*	2896.73 (109.685)**	-24.613 (13.345)*
Nationally based depository institutions	£500	0.035	1.896	536.48 (148.160)**	-2.991 (2.192)*
	£1000	0.002	0.149	112.964 (40.794)**	0.229 (0.594)
	£5000	0.088	6.18**	3871.319 (577.573)**	-20.896 (8.406)**
	£10000	0.153	11.597**	3532.094 (415.340)**	-20.585 (6.045)**
Mortgages					
Overall. All pairs of depository institutions included	New borrower rate	0.007	18.34**	202.549 (4.361)**	-1.168 (0.273)**
	Existing borrower rate	0.007	18.663**	203.961 (4.388)**	-1.185 (0.274)*
Regional and locally based depository institutions	New borrower rate	0.006	8.646**	199.839 (6.573)**	-2.614 (0.889)**
	Existing borrower rate	0.007	9.161**	205.281 (6.586)**	-2.696 (0.891)**
Nationally based depository institutions	New borrower rate	0.039	4.153**	240.103 (27.416)**	-0.908 (0.445)*
	Existing borrower rate	0.037	0.137	182.446 (28.583)**	-0.172 (0.464)

** = Significant at 5%, * = Significant at 10%

When considering all pairs of depository institutions for instant access deposit accounts, the *Overlap* variable provides appropriately signed and significant coefficients for two of the four deposit quantities (£500 and £10,000). This presents statistical evidence that the presence of a unified national market can not be rejected for all instant access deposit accounts, with the exception of interest rates forwarded for the smallest (£500) and largest amounts (£10,000) deposited. For mortgages, small yet significant local market influences are present for both new and existing mortgage rates. This indicates that geographical influences are persistent throughout the UK mortgage market and the assumption of a unified national market for these financial services is misplaced.

The sample is also divided into pairs of depository institutions that both have only a national and a regional presence. Geographical influences appear to exist for all but one (£5000) of sums deposited for nationally based depository institutions. These geographical influences are not present for all but the highest value of instant access deposits (£10,000) for regionally based depository institutions. This finding indicates that geographic effects we have identified on instant access deposit interest rates are driven to some extent by depository institutions with a national market presence. Both samples of regionally and nationally based depository institutions provide significant results for the new borrower mortgage rates indicating significant geographic influences on these markets. For existing borrower rates, significant geographic effects appear to be present only for regionally based depository institutions, with no significant results presented for nationally based depository institutions.

5. Conclusions

The examination of what defines a market is central to understanding competition and any barriers in markets. Through quantifying the geographical extent of markets, the physical space over which competition in such markets operates can be more clearly delineated. This issue is of substantial contemporary importance as the regulators of retail financial markets have increasingly emphasised the importance of effective and transparent competition, both in the

assessment of potential bank mergers and acquisitions and in extending regulatory protection of the consumers of these markets.

This study has tested the degree to which the location of branch networks are influential in the interest rate setting policies of depository institutions. Due to the low model fit observed in all models estimated, factors exogenous to the model may also be influencing our results. Significant geographical influences appear to exist in the UK mortgage market and for the smallest and largest instant access deposits. For instant access deposit accounts, geographical influences appear to be associated with nationally based institutions. This finding reflects that we are observing different interest setting strategies for instant access deposit accounts employed by depository institutions with nationally and regionally based branch networks. Conversely, the mortgage market appears to be more consistently influenced by geographically factors for both nationally and regionally based depository institutions. This finding is perhaps not surprising as the mortgage market is strongly influenced by regional housing markets in the UK.

These findings are congruent with previous work on market definition in the US (Biehl, 2002) and interest rate setting by different types of UK depository institution operating in the UK deposit market which suggest differential interest rate setting by different depository institutions of different sizes. For example Ashton and Letza (2003) indicate that building societies, often with smaller branch networks, consistently set distinct levels of interest rates on deposit accounts from retail banks and converted building societies which generally possess larger branch networks. This is an important finding for the future assessment of competition in the UK mortgage market, in that depository institutions with large and small branch networks appear to set interest rates according to different criteria and operate in terms of the national market and local and regional markets, respectively. A fuller description of competition in UK banking markets than has been previously produced would allow for geographic influences provided by depository institutions with a more regional orientation.

Explanations of these distinct interest rate setting behaviours by depository institutions with national and regional branch networks could be linked to a number of explanations. UK

depository institutions could be setting interest rates with respect to their principal competitors, either at regional levels or for depository institutions with larger branch networks, at a national level. What we have observed here may be the setting of interest rates with respect to different 'reference' or 'strategic' groups within the overall UK retail banking market, as has been previously observed in the USA (Amel and Rhoades 1988, McNamara *et al* 2002). Specifically, the geographical influences observed for nationally based institutions could be interpreted as these institutions setting their interest rates in relation to other nationally based institutions, as part of competitor reference groups (Daniels *et al* 2002, Fiegenbaum and Thomas 1995). Equally, depository institutions with a smaller branch network, by feature of their more limited scope of operations could be more dependent on instant access deposit accounts and the mortgage market as sources of revenue, than larger more diversified and nationally based depository institutions, which may lead to distinct interest rate setting strategies. Consequently, regionally focused institutions may be forced to compete more vigorously in terms of interest rates for access to these markets leading to the regional variation in interest rates observed. It is considered that the possible identification of such intra-market influences on interest rate or price setting is a logical next step for both investigation of competition within the UK retail banking market and for developing the understanding of definition of market boundaries generally.

We conclude that the UK mortgage market and the market for the smaller and larger value instant access deposits do not appear to be nationally unified in terms of their interest rates. A unified national market seems exist for some, but not all, instant access deposits. These findings are contrary to previous assessments of competition and interest rate setting which have been based on the 'strong' assumption that a national and unified market exists for all retail banking services exists in the UK.

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Appendix 1 Depository Institutions used in the Study.

Abbey National
AIB Bank (GB)
Alliance and Leicester
Bank of Ireland (NI)
Bank of Ireland Home Mortgages (UK)
Bank of Scotland
Barclays
Barnsely Building Society
Bath Building Society
Birmingham Midshires
Bradford and Bingley
Bristol and West Central Mortgage Services
Britannia
Buckinghamshire Building Society
Cambridge Building Society
Chelsea Building Society
Cheltenham and Gloucester
Chesham Building Society
Cheshire BS
Chorley and District Building Society
Clydesdale Bank
Coutts and Co.
Coventry Building Society
Darlington Building Society
Derbyshire Building Society
Dudley Building Society
Dunfermline Building Society
Earl Shilton Building Society
First Trust Bank
Furness Building Society
Halifax
Hanley Economic Building Society
Hinckley and Rugby Building Society
Holmesdale Building Society
HSBC/Midland Bank
Ipswich Building Society
Kent Reliance Building Society
Lambeth Building Society
Leeds and Holbeck Building Society
Leek United Building Society
Lloyds/TSB Bank
Loughborough Building Society
Manchester Building Society
Mansfield Building Society
Market Harborough Building Society
Marsden Building Society
Melton Mowbray Building Society
Mercantile Building Society
Monmouthshire Building Society
National Counties Building Society
Nationwide Building Society
Natwest Home Loans
Newbury Building Society
Newcastle Building Society
Northern Bank
Northern Rock
Norwich and Peterborough Building Society
Nottingham Building Society
Portman Building Society
Principality Building Society
Progressive Building Society
Royal Bank of Scotland
Saffron Walden Herts and Essex Building Society
Scarborough Building Society
Scottish Building Society
Skipton Building Society
Staffordshire Building Society
Stroud and Swindon Building Society
Tipton and Cosely Building Society
Ulster Bank
Universal Building Society
Vernon Building Society
West Bromwich Building Society
Woolwich
Yorkshire Bank
Yorkshire Building Society