Cross-Country Comparisons of Competition and Pricing Power in European Banking

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Abstract

Studies of banking competition and competitive behaviour both within and across countries typically utilise only one of the few measures that are available. In trying to assess the relative competitive position of banking markets in 14 European countries, we find that the existing indicators of competition often give conflicting predictions, both across countries and over time. Seeking greater consistency, we attempt to separate bank pricing power from other, non-core, influences embodied in competition measures. While there is some improvement in cross-country consistency, the main result is that our measure of bank pricing power suggests that banking market competition in Europe may well be stronger than implied by traditional measures and analysis.

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1. Introduction

Almost all studies of bank competition deduce competitive behaviour within or across countries from basically just one of a small number of measures. These include measures that are estimated statistically as well as other indicators (usually ratios) obtained from bank financial statements. While some researchers may prefer one measure over another, there is no consensus regarding the "best" measure by which to gauge competition (Northcott, 2004). Indeed, these measures are typically presumed to be equivalent and so are expected to yield essentially the same result. Our goal is to test this widely held view. We do this by determining how consistent the various measures are in predicting the level and change in competitive behaviour in Europe following the recent wave of banking consolidation. It turns out that the choice of which competition measure to use can make a difference. Attempting to achieve greater consistency, we utilise a procedure developed in the frontier efficiency literature to identify an indicator of bank pricing power separate from other influences contained in current measures of competition. Although the improvement in consistency is marginal, the result indicates that European banks' power over price appears to be weaker than implied using established approaches.

Over the past decade, European banking markets have become more concentrated. The number of banks in the European Union decreased from around 9,624 in 1997 to less than 7,500 in 2003, an 18% reduction (ECB, 2004). The asset market share of the five largest banks in 11 of the 14 European Union (EU) banking markets rose over 1997-2003. Overall, this five-firm concentration ratio (CR-5) expanded from 46% to 53% (ECB, 2004).[1]

If the different indicators of banking market competition move in the same direction and to a similar degree then a consensus on which measure may be the most informative and reliable is less important than if their movements are often quite different. As we show below, the latter has been the case for most countries in Europe. Consequently, the assessment of banking market competition within or across countries may differ depending on the measure chosen to assess it. This makes it more difficult to determine the overall state of banking market competition in Europe, to assess the effects of deregulation, and to judge the likely effects of prospective mergers.

[1] Similar results for European banking sector concentration are reported in ECB (2003, 2004) and Jansen and DeHaan (2003) provide further information. The growth in asset concentration among the 10 largest banks in the U.S. was even more rapid, rising from 22% to 46% over 1980-2003 (Piloff, 2004).

In what follows we compare structural and non-structural indicators of competition across 14 European banking markets over 1995 to 2001. In particular, we measure competition using indicators from the so-called New Empirical Industrial Organization (NEIO) literature. This literature suggests that measures of the mark-up of price (average revenue) over marginal costs (giving a Lerner index) and the degree to which input price changes are reflected in output prices (the H-statistic) provide "realized" measures of the degree of banking market competition. These indicators are estimated using bank-level data for the European Union and compared with a standard market structure measure of concentration (a Hirschman-Herfindahl index) and other bank performance indicators (net interest margin and return on assets) that are often used to gauge the competitive features of the industry. The goal is to determine the consistency of these five different direct or indirect indicators of banking competition and, if inconsistent, try to determine what economic influences may be associated with these differences. Following an approach similar to that of Demirgüç-Kunt, Laeve, and Levine (2004) and Claessens and Laeven (2004), bank-specific and country-specific characteristics (such as cost efficiency and other influences) are examined to determine their influence on the various measures of competition in Europe.

This study is divided into six sections. Some background information on banking competition measures and results for Europe is provided in Section 2. This is followed in Section 3 with an analysis of the evolution of the different measures of banking competition over 1995-2001 for 14 European countries. In this cross-country comparison, we are looking for consistency among the various indicators of banking competition. An econometric analysis in Section 4 is used to try to identify the importance of cross country differences in market concentration, cost efficiency, non-traditional services, impact of the business cycle, inflation, and contestability influences contained in the various competition measures. This is applied to all 14 European countries and, later, to 4 of the largest countries. Using procedures developed in the frontier efficiency literature in Section 5, we attempt to isolate a perhaps more accurate indicator of bank pricing power from current measures of market competition. The cross-country variation of this indicator differs somewhat from that of standard competition measures. The study ends with a brief summary of our results in Section 6 along with a discussion of some implications of the analysis for competition policy in Europe.

2. Competition in Banking: A Brief Survey

Two types of competition measures have generally been used in the established literature to analyse the competitive features of the banking industry – these are referred to as structural and non-structural indicators. Traditional industrial organization theory focuses on the Structure-Conduct-Performance (SCP) paradigm where the competitive features of industry are inferred from structural characteristics that influence firm behaviour and performance. Market structure can be indicated by various measures including market shares, concentration ratios for the largest sets of firms, or a Hirschman-Herfindahl index. The SCP approach aimed to see if there was a relationship between the structural features of an industry and firm performance (measured using either some profits or price indicator). Typically, this approach was based on empirical studies during the 1940s and 1950's that originally focused on manufacturing industries with high fixed costs, few competitors, and limited new firm entry. Under these conditions increased market concentration was associated statistically with higher prices and greater than normal profits. With smaller numbers of firms and limited contestability, it is easier to collude--explicitly or implicitly--to control these market outcomes, resulting in uncompetitive behaviour.

While the SCP approach argues that a concentrated market structure is associated with higher prices and profits, higher profits could alternatively be the result of greater efficiency in production and managerial organization (Smirlock, 1985; Evanoff and Fortier, 1988). Berger (1995) finds some evidence that the efficiency hypothesis holds in U.S. banking in that this hypothesis explains somewhat more of the variation in bank profitability than does the traditional SCP paradigm. However, the statistical relationships are weak and both hypotheses together explain less than 20% of the variation in profits across banks. While the earlier U.S. literature tends to find evidence that the traditional SCP paradigm holds, later studies that test both the SCP and efficiency hypotheses jointly tend to reject the SCP paradigm in favour of the efficiency hypothesis.[2] In contrast, European banking studies tend to find more evidence that the traditional SCP hypothesis holds (Goddard, et al., 2001). For Europe, structural factors seem to be important in determining competitive behaviour.

An alternative view is embodied in the literature examining the strategic reactions of competing oligopolies (from the earliest work of Cournot and Bertrand to more recent work by Stigler, 1964). The extensive theoretical literature on oligopoly behaviour has long recognised that major firms in concentrated markets can compete

[2] See Gilbert (1984) and Berger, Demsetz, and Strahan (1999) for reviews of the U.S literature.

aggressively with one another, and this usually involves firms having to guess the price and quantity reactions to strategic moves made by each other (so-called conjectural variations). In these relationships, the competitive environment is determined by the strategic reactions of firms and not necessarily by the structure of the market.

In addition, the role of market contestability advanced initially by Baumol (1982) and Baumol, Panzar and Willig (1982) is an important qualification when assessing the likely predictive accuracy of the SCP paradigm. In contestable markets the competitive behaviour of firms is determined by (actual or potential) entry and exit conditions (sunk costs). With low entry restrictions on new firms and easy exit conditions for firms that fail to earn reasonable profits, incumbent firms in an industry are pressured to behave competitively to deter entry even if the existing market is concentrated. Here structural features of a market are irrelevant in determining market competition since entry and exit conditions determine competitive behaviour. As in the case of competing oligopolists, the competitive features of a contestable market cannot be inferred using structural indicators so separate indicators based on realized pricing behavior and/or market contestability need to be found.

Non-structural indicators of competition used to quantify realized firm pricing behaviour are (mainly) based on measures of monopoly power developed by Lerner (1934). In particular, these include measures of competition between oligopolists such as Iwata (1974)[3] and those that test for competitive behaviour in contestable markets by Bresnahan (1982), Lau (1982) and Panzar, and Rosse (1987). This empirical literature is referred to as the New Empirical Industrial Organization (NEIO) approach. These measures are developed from (static) theory of the firm models under equilibrium conditions and typically use some form of price mark-up over a competitive benchmark. In the Lerner index, it is the mark-up of price (average revenue) over marginal cost and the divergence of price from perceived marginal revenue for the Bresnahan measure. The higher the mark-up, the greater the realized market power. An alternative approach, developed by Panzar and Rosse (1987)--the H-statistic-- focuses on the degree to which changes in the average cost of different inputs leads to subsequent changes in average revenues. The greater is the transmission of cost changes into price changes, in both directions, the more competitive the market is deemed to be since costs would then determine price--not market concentration.[4]

[3] Also see Berg and Kim (1998).

[4] Other approaches consist of those developed by Kessidis (1991) who develops a model of contestability focusing on sunk costs and Corvosier and Gropp (2002) who look at the role of information technology, its influence on sunk costs, and competition in European deposit and loan markets.

The Iwata (1974) model provides a framework for estimating conjectural variation values--firms' reactions to changing market shares and pricing by rivals--for banks that supply homogenous products. As far as we are aware, the Iwata measure has only been applied once to banking by Shaffer and Di Salvo (1994). While they find evidence of imperfectly competitive behaviour in a highly concentrated duopoly market, the market examined was very small and local in nature.[5]

Much wider use has been made of the measures suggested by Bresnahan (1982) and Lau (1982), following the empirical framework outlined in Bresnahan (1989). This approach requires a structural model of banking competition where a parameter representing the apparent market power of banks is included. This parameter simply measures the extent to which the average firm's marginal revenue varies from average revenue indicating the slope of the demand curve and hence the implied market power of firms over price. This approach was first applied to the banking industry by Shaffer (1989, 1993) for the U.S. loan market and the Canadian banking industry, respectively. Applications of this approach to European banking are numerous and include studies on Finnish banking by Suominen (1994), on various European countries by Neven and Röller (1999) and Bikker and Haaf (2002), on Italian banking by Coccerese (1998) and Angelini and Cetorelli (2003), on Dutch consumer credit markets by Toolsema (2002), and on Portuguese banking by Canhoto (2004)[6]. Most of this literature finds little evidence of market power in European banking, the exception being Neven and Röller (1999) who find significant monopoly collusive behaviour when they consider the corporate and household loan market across six countries between 1981 and 1989.

There is also an extensive literature that uses the Panzar and Rosse (1987) H-statistic, which relates cost changes to price changes, to investigate competitive conditions in European banking and elsewhere. Molyneux, Lloyd-Williams, and Thornton (1994), Bikker and Groenveld (2000), De Bandt and Davis (2000), Weill (2003), Boutillier, Gaudin, and Grandperrin (2004), and Koutsomanoli-Fillipaki and Staikouras (2004) all find that monopolistic competition is prevalent across various European countries. Claessens and Laeven (2004) examine the determinants of the H-statistic for a sample of over 50 banking markets including Europe. In virtually every country evidence of monopolistic competition is found. They also find no relationship between competitive conditions and market structure as measured by concentration ratios and the Herfindahl index. Individual country studies by Vesala (1995) for

[5] The market investigated contained a sample of banks operating in south central Pennslyvania.

[6] See also Uchida and Tsutsui (2004) for a study of competition in Japanese banking using the Bresnahan approach.

Finland, Coccorese (1998) and Hondryiannis, Lolos, and Papapetrou (1999) for Greece, Hempell (2002) for Germany, Coccorese (2004) for Italy, and Maudos and Pérez (2003) and Carbó, Humphrey, and Rodríguez (2003) for Spain all come to similar conclusions – namely that monopolistic competition is prevalent in European banking systems. Evidence as to whether competition in these countries is improving or not has been mixed.

Finally, a number of recent studies have used the Lerner index to try to determine the trend in competitive behaviour over time. Generally, these studies suggest a worsening of competitive conditions in European banking during the 1990's. (see Fernández de Guevara and Maudos, 2004; Fernández de Guevara, Maudos and Pérez, 2005 and 2007). This is usually inferred from a rising margin or a higher Lerner index. However, Maudos and Fernández de Guevara (2004) show that while these margins fell in 10 out of the 14 EU banking sectors studied over 1993-2002, this reduction can be compatible with a weakening of competitive conditions (an increase in market power) as explained below. A similar result is found when the analysis is applied on a regional basis within a country (Carbó, Humphrey, and Rodríguez, 2003; Maudos and Pérez, 2003). These results are at odds with the general perception that competition has increased in Europe (c.f., Padoa-Schioppa, 2001; European Central Bank, 2003). A likely explanation for the difference in these views is that competition can increase in traditional markets for banking services--where the Lerner index is often seen to fall over time--while banking firms have found new sources of (fee) income which expands their overall return on assets. That is, the Lerner index may fall for deposits and/or loans (see Carbó, Fernández, Humphrey and Maudos, 2005) while at the same time a more aggregate indicator of overall competition--the return on assets--may rise as income from off-balance-sheet activities expands. Another explanation focuses on the increased efficiency experienced by European banks due to cost savings from the shift to electronic payments and the substitution of ATMs for expensive branch offices (Carbó, Humphrey, and Lopez del Paso, 2004; Humphrey, Willesson, Bergendahl, and Lindblom, 2006). Lower operating costs from these two sources of technological change can affect the Lerner index and return on assets but have no effect on net interest margins. For example, technological advances may lower marginal costs faster than prices suggesting a greater mark-up and hence greater market power. In such a case, simply studying falls in bank traditional bank prices (such as a declines in net interest margins) many not necessarily be indicative of greater competition if costs have fallen faster – yielding a higher Lerner index suggesting a decline in the competitive environment. Hence, different measures of competitive behaviour may imply varying results for competition, depending on which measure is being relied upon.

3. Measures of Banking Competition: How Consistent are They?

3.1. Competition Measures and Sampled Banks

Measures of competitive behaviour of commercial banks in the European Union are first defined and then examined for consistency over 1995-2001. We include all types of depository institutions (commercial banks, savings banks, and co-operative banks) so as to provide a broad representation of banking sectors in each country. Our indicators of EU banking competition are based on a balanced panel of 1,912 banks over 7 years giving 13,384 observations. Data are from the BankScope database provided by Fitch-IBCA. The composition of the sampled banks is shown in Appendix Table A1.

The five indicators used to infer competitive behaviour in the EU banking industry are:

- NTMTA: Net interest margin/total assets. This reflects the loan-deposit interest spread or interest rate mark-up after controlling for different sized banks by deflating by total asset value.

- LERNER: Lerner index, defined as $(P_{TA} - MC_{TA})/P_{TA}$. Here P_{TA} is the price of total assets computed as the ratio of total (interest and non-interest) income to total assets. MC_{TA} is the marginal cost of total assets computed from a standard translog function with a single output (total assets) and three input prices (deposits, labour and physical capital) using panel data (a fixed effects model is estimated) covering all 14 countries over 1995-2001. Our definition of price is broader than the usual net interest margin measure NTMTA since the numerator of the Lerner index includes both interest and non-interest income.[7]

- ROA: The ratio of bank net income to the value of total assets. This is a profitability measure that considers all sources of income, not just that from traditional loan and security asset holdings.

[7]The model most often used to obtain the Lerner index of market power in banking is the Monti-Klein imperfect banking competition model. This model examines the behaviour of a monopolistic bank faced with a loan demand curve of negative slope and a deposit supply of positive slope. More estimation details for the Lerner index are in Fernández de Guevara, Maudos, and Pérez (2005).

- H-STATISTIC: Based on a reduced-form revenue equation, the so-called H-statistic (Panzar and Rosse, 1987) measures the sum of elasticities of the revenues with respect to the input prices. The estimated value of H-statistic ranges between $-\infty$ and 1. Under perfect competition, an increase in input prices increases marginal costs and marginal revenues by the same amount as the initial cost increase (H=1). A value of the H-statistics between 0 and 1 indicates monopolistic competition. Values equal or less than 0 are consistent with a monopoly (an increase in input prices will increase marginal costs, reduce equilibrium output and consequently reduce revenues). Panel data for all 14 countries over 1995-2001 was used in a double log linear equation. The H-statistic is the ratio of the percent change in total revenue from all sources to the percent change in the sum of three input prices (funding, labour and capital), holding constant total banking output (total assets), leverage, and two balance sheet composition variables (loans to assets and deposits to total liabilities). A translog revenue function is specified including levels, interactions and squared terms of inputs prices[8]. Country dummies were added as intercept shift variables.

- HHI: A Hirschman-Herfindahl index of banking market concentration defined as the sum of the squares of the market shares of all banks (commercial banks, savings banks, co-operative banks, etc) existing in a country. More formally, $HHI = \sum_{i=1}^{n} (\Pi i)^2$ with Πi being the market share of every bank in the market, and *n* being the number of banks. The HHI measure is more informative than an n-firm concentration ratio since it will reflect the similarity or difference in market shares among firms in a market even when the n-firm concentration ratio between two countries (or time periods) are the same.

3.2. Similarities/Differences Among Non-Structural Competition Measures

The four non-structural measures of competitive behaviour are often used interchangeably since it is believed that they tend to effectively measure the same thing--control over price and profitability--but go about it differently. Before we relate these measures to one another and see how they vary over time in different countries, it is useful to first show more clearly how they are actually related. The base case to which each measure is compared is simply profits before losses or taxes per euro of asset value or (TR - TC)/TA where TR is total revenue, TC is total cost, and TA is total assets. The purpose is to illustrate what has to be done to (TR - TC)/TA in order to obtain the net

[8] Consequently, H-statistic can be estimated at bank-level.

interest margin (NTMTA), Lerner index, return on assets (ROA), and H-statistic measures that are commonly used to gauge market competition in banking. These manipulations are shown below:

NTMTA = (interest income - interest expense)/TA

= [(TR - non-interest revenue) - (TC - operating cost)]/TA

= (TR - TC)/TA - (non-interest revenue - operating cost)/TA

Lerner index = (P - MC)/P

= (TR/TA - MTC/MTA)/(TR/TA), holding input prices constant.

Under constant returns to scale MTC/MTA = TC/TA, we have

= (TR - TC)/TA divided by TR/TA.

ROA = (net income)/TA

Where net income = TR - losses - taxes - TC, we have

= (TR - losses - taxes - TC)/TA

= (TR - TC)/TA - (losses + taxes)/TA.

H-statistic = $\sum \partial TR / \partial(input\ prices)$, holding output level and mix constant.

As (average input prices) = (average cost), we have

H-statistic = ∂(TR/TA)/∂ (TC/TA) holding TA constant.

When the H-statistic is stable, the margin equals the average, so

(stable H-statistic) = (TR/TA)/(TC/TA) = TR/TC.

Subtracting 1 from both sides gives

(stable H-statistic) - 1 = TR/TC - 1 = (TR - TC)/TC.

Multiplying both sides by TC/TA, we get

[(stable H-statistic) -1](TC/TA)= (TR - TC)/TA.

This way of expressing our four non-structural competition measures suggests that the benchmark unadjusted return on assets (TR - TC)/TA can be defined as:

= NTMTA + (non-interest revenue - operating cost)/TA

= Lerner index times (TR/TA) assuming no scale economies

= ROA + (losses + taxes)/TA

= a (stable H-statistic - 1) times (TC/TA).

Thus while the competition literature often uses these four measures interchangeably, they can differ in their cross-country competition predictions when:

(a) there are important differences in the share of fee and off balance sheet revenues in TR across countries (reflecting expanded revenues from non-traditional banking deposit and loan services);

(b) operating cost is falling at different rates across countries (due most likely to differences in the shift to lower cost electronic payments and ATMs);

(c) scale economies differ due to markedly different average sizes of banks among smaller and larger European countries; and

(d) there are marked differences in loan losses and taxes across countries.

In what follows we assess whether or not these differences may be important enough among banks within or across countries to affect the consistency of the predictions of the apparent level and change in competitive behaviour across countries in Europe.

3.3. Cross-Country Consistency of Market Competition Measures

Table 1 shows the means of the five indicators of banking market competition across our 14 European countries over 1995-2001 as well as for the whole EU[9]. There are significant cross-country differences in these competition measures. For the net interest margin, Denmark and Italy have the highest margins (at 4.65% and 3.45%, respectively) while Luxemburg and Ireland have the lowest (at .79% and 1.55%). The EU average is toward the upper range of these two extremes (2.34%). As seen, the difference in average net interest margins is quite large.

The Lerner index (LERNER) is often used as an indicator of banking competition and also varies considerably across countries. Denmark and Spain have the highest values (at 21.6% and 20.1%, respectively) while Luxembourg (11.0%) and the UK (11.5) have the lowest. The overall mark-up of price over marginal cost for the EU is 15.6%. The Lerner index is not a mark-up over all costs, only over marginal costs. While these mark-ups may appear "high", they necessarily include the need to recover

[9] We exclude Finland as only one observation per year is available.

unit fixed expenses as well as a "normal" return on invested financial capital. The Lerner index is a "level" measure of the percent that price exceeds marginal cost while the H-statistic is a "change" measure indicating the extent to which percent changes in input costs are reflected in price changes. Thus one can think of them as basically reflecting the price-cost spread in average or marginal terms.

A broad measure of banking profitability is the return on assets (ROA) which for the EU averages 69 basis points. The ROA ranges from 27 basis points in Germany and 47 basis points in Luxemburg to 139 in Greece and 129 in Denmark.

TABLE 1: MEAN VALUES OF COMPETITION MEASURES FOR EUROPE OVER (1995-2001)*

	NTMTA	LERNER INDEX	ROA	H-STATISTIC	HHI
Austria	2.02%	16.85%	0.48%	0.75	677.33
Belgium	2.31	13.30	0.48	0.59	1201.08
Denmark	4.65	21.57	1.29	0.61	1027.72
France	2.49	14.08	0.61	0.63	426.42
Germany	2.64	14.23	0.27	0.62	188.21
Greece	2.55	16.93	1.39	0.57	1529.54
Ireland	1.15	15.42	0.56	0.79	805.05
Italy	3.45	15.80	0.74	0.69	327.64
Luxemburg	0.79	10.95	0.47	0.97	304.68
Netherlands	1.90	17.92	0.86	0.80	1285.03
Portugal	2.19	15.82	0.54	0.91	843.70
Spain	3.02	20.07	0.82	0.63	525.99
Sweden	1.65	13.92	0.64	0.50	968.72
U.K.	2.00	11.45	0.56	0.73	359.53
EU	2.34	15.59	0.69	0.70	747.90

* Mean values of NTMTA, the Lerner index, and ROA are percentages. The H-statistic usually varies between zero and 1.0 while the HHI measure has no simple percent or basis point interpretation. The values of the H-statistic for each national banking system are derived from the estimated coefficients of a fixed effects model which is estimated separately for each country. To obtain yearly H-statistic values for each bank, we evaluated our estimated equations using each year's bank-specific input prices and other information, giving an H-statistic that varied by country, by year, and by bank. The NTMTA, Lerner index, and ROA measures also vary by country, by year, and by bank. For sample size see Appendix A1.

Turning to the H-statistic, a value close to 1.00 implies that changes in costs are basically fully reflected in changes in output prices, implying a competitive market, while a value close to 0.0 implies essentially no competitive pressure so banks adjust prices with very little regard to changes in costs. The intermediate values seen in Table 1 range from .50 to .97 and suggest that all countries are only partly sensitive to cost

changes in setting prices. This indicates an intermediate degree of market power over price (monopolistic competition) which does not differ much among the countries. With somewhat higher H-statistics, Luxembourg and Portugal appear to have marginally more competitive markets than do Sweden and Grecee.

The Hirschman-Herfindahl measure is an indicator of market structure (HHI) where higher values reflect more concentrated banking markets and (potentially) less competition. The highest level of banking market concentration within the EU is found in Greece (1,530) and the Netherlands (1,285) while the lowest is indicated for Germany (188) and Luxemburg (305). Market concentration in the EU averages 748, a value which would indicate a competitive market using the U.S. criteria for approving a banking merger.

Casual inspection of our five competition measures across European countries in Table 1 suggests that neither the net interest margin nor the Lerner index is well correlated with the HHI structural measure. This was also pointed out in Bikker and Haaf (2002), Fernández de Guevera, et al. (2004), and Claessens and Laeven (2004) who observe little relationship between structural and non-structural measures of bank competition. This can be seen more directly in Table 2 where the similarity or consistency of the five competition measures from Table 1 is shown. The correlation coefficients (r values) in Table 2 show the direction of the relationship between any two competition measures while the R^2s in parenthesis show the extent to which the paired measures contain the same information. All but one of the correlation coefficients are positive so that when one measure is relatively high (low) the others are also relatively high (low). Since a higher H-statistic implies greater competition while for the other four measures higher values imply less competition, the H-statistic results have been multiplied by -1.0 in Table 2 (and in all subsequent analysis). Now in all cases a higher value of all competition measures implies less competition. Thus the negative relationship between the H-statistic and the other measures indicates that when the other four competition measures suggest greater competition, the H-statistic suggests the opposite.

The R^2 values in parenthesis in Table 2 directly indicate the degree of consistency among our five banking competition measures. If any of these pair-wise values were equal to 1.0, then either of the paired indicators would be a perfect substitute for the other--each would contain the same information and be perfectly consistent with each another. If this pair-wise value were equal to .50, however, then only 50% of the time would either measure contain the same information. While there would be a degree of consistency between the paired competition measures if $R^2 = .50$,

it would not be strong since some of the time one indicator could yield opposite results regarding the extent of banking competition. Finally, if the pair-wise value is at or close to 0.0, then the paired competition measures contain no similar information, are basically uncorrelated, and would only randomly yield similar information regarding competition.

TABLE 2: CROSS-COUNTRY CORRELATIONS AMONG MEAN VALUES OF COMPETITION MEASURES FOR EUROPE*

(Data are from Table 1, 1995-2001; n = 14)

	NTMTA	LERNER INDEX	ROA	H-STATISTIC	HHI
NTMTA	1.00				
LERNER INDEX	.68 (.46)	1.00			
ROA	.55 (.30)	.66 (.44)	1.00		
H-STATISTIC	.48(.24)	.24 (.06)	.33 (.11)	1.00	
HHI	.07 (.00)	.39 (.15)	.62 (.39)	.26 (.07)	1.00

* Values not in parenthesis are correlation coefficients (r) while next to them are their squared values (R^2). The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

The relationships between the five competition measures in Table 2 are not very strong since at most only 46% of the information in one competition measure--the net interest margin (NTMTA)--is also contained in another--the mark-up of price over marginal cost (the Lerner index). And at most 44% of the information in the Lerner index is contained in the ROA. All the other R^2s are usually considerably less than these values. In sum, the net interest margin, the Lerner index, and the return on assets all seem to be only weakly consistent with each other. The market structure measure HHI is mostly unrelated to these four non-structural indicators while the H-statistic and the other measures are weakly negatively related.

TABLE 3: CROSS-COUNTRY CORRELATIONS AMONG TIME-SERIES VALUES OF COMPETITION MEASURES FOR EUROPE

(From annual data, 1995-2001; n = 7 x 14 = 98)

	NTMTA	LERNER INDEX	ROA	H-STATISTIC	HHI
NTMTA	1.00				
LERNER INDEX	.47 (.22)	1.00			
ROA	.46 (.21)	.61 (.37)	1.00		
H-STATISTIC	.44 (.19)	.25 (.06)	.30 (.09)	1.00	
HHI	.06 (.00)	.29 (.09)	.49 (.24)	.23 (.05)	1.00

Values not in parenthesis are correlation coefficients (r) while next to them are their squared values (R^2). The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

Table 2 illustrated the relationship among country mean values of the five competition measures averaged over the 7 time periods (so n = 14, one value per country). Table 3 uses the time-series data underlying these country mean values so mean values for each of 14 countries are observed for each of 7 years (so n = 98). The result, although weaker since variation over time is added to the analysis, is essentially the same as before. Namely, the net interest margin, the Lerner index, and the return on asset measures are only weakly positively related to one another, showing a low degree of consistency. The market structure measure HHI is only weakly correlated with the return on assets while the H-statistic is either negatively or randomly correlated with the other measures. Could the consistency between the structural indicator HHI and the non-structural measures be improved by considering differences in market contestability and other differences among countries? This is something we investigate below in Section 4.

3.4. Within-Country Consistency of Market Competition Measures

Repeating the time-series correlation analysis seen in Table 3 for banks within each of the 14 European countries separately, we obtain Tables 4A and 4B. The weak conclusions regarding consistency among competition measures derived above are seen to be even weaker when individual countries are being compared since the strength of the relationships differ both in size and sign across countries (see last row in table). For example, when the net interest margin is paired with either the Lerner index or the return on assets (the first two columns in Table 4A), the relationship between these two pairs is negative for basically half of the countries and positive for the other half. Indeed, out of the 84 correlations shown in Table 4A, 54% (45) are positive while 46% are negative. Neglecting the H-statistic raises the proportion of positive correlations to 69%. However, in this truncated comparison only half of the 14 countries (Belgium, Denmark, Germany, Ireland, Netherlands, Sweden, and the UK) have all positive correlations among the NTMTA, Lerner, and ROA measures while the other seven countries do not.

TABLE 4A: PAIR-WISE CORRELATIONS: NON-STRUCTURAL COMPETITION MEASURES*

(Annual Data 1995-2001; n = 7)

	Non-Structural vs. Non-Structural Measures					
	NTMTA LERNER	NTMTA ROA	NTMTA H-STATISTIC	LERNER ROA	LERNER H-STATISTIC	ROA H-STATISTIC
Austria	-0.55	0.32	-0.83	0.31	0.77	-0.30
Belgium	0.30	0.34	0.69	0.52	-0.44	-0.16
Denmark	0.60	0.96	-0.86	0.63	-0.25	-0.84
France	-0.82	-0.97	0.85	0.82	-0.83	-0.81
Germany	0.85	0.97	0.86	0.90	0.48	0.79
Greece	-0.85	-0.47	-0.94	0.59	0.90	0.32
Ireland	0.57	0.68	0.72	0.90	0.56	0.41
Italy	-0.67	0.70	0.41	-0.15	-0.39	0.20
Luxemburg	-0.67	-0.57	0.50	0.84	-0.47	0.03
Netherlands	0.50	0.28	-0.76	0.72	-0.44	-0.24
Portugal	-0.65	-0.43	-0.78	0.62	0.94	0.66
Spain	-0.88	-0.51	-0.88	0.71	0.98	0.68
Sweden	0.71	0.54	0.61	0.76	0.59	0.90
U.K.	0.83	0.50	-0.33	0.86	0.22	0.52
(+ r value)/14	7/14	9/14	7/14	13/14	8/14	9/14

* Only correlation coefficients (r's) are shown here. The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

Across countries, only four of the ten pair-wise comparisons in Tables 4A and 4B show a useful degree of consistency. In Table 4A, there is a consistently negative relationship between the net interest margin and the H-statistic (only 1 positive r value out of 14, Column 3) while the Lerner index and the return on assets show a consistently positive relationship (13 positive r's out of 14, Column 4). In Table 4B there is a fairly consistent inverse relationship between the net interest margin and the structural HHI measure (with 5 positive r's out of 14, Column 1). Even so, this is a long way from using these different measures more or less interchangeably as is the maintained hypothesis in the literature when only one competition measure is used to draw conclusions from.

The conclusion so far has to be that it is apparently not possible to select one or two measures of banking competition that seem to be informative in one country and necessarily expect the same two measures to be equally informative when applied to another country. The cross-country results are just too inconsistent. What about over time? Did the competition measures generally fall--indicating an improvement in competition--over time? Or are the measures also inconsistent over time as well?

TABLE 4B: PAIR-WISE CORRELATIONS: NON-STRUCTURAL V STRUCTURAL COMPETITION MEASURES*

(Annual Data 1995-2001; n = 7)

	Non-Structural vs. Structural Measure:			
	NTMTA HHI	LERNER HHI	ROA HHI	H-STATISTIC HHI
Austria	-0.18	0.13	-0.53	0.50
Belgium	-0.91	-0.07	-0.34	-0.77
Denmark	0.17	0.14	0.09	-0.22
France	-0.77	0.84	0.81	-0.51
Germany	-0.73	-0.39	-0.58	-0.80
Greece	0.91	-0.77	-0.48	-0.79
Ireland	0.94	0.73	0.84	0.69
Italy	0.55	-0.22	0.56	-0.18
Luxemburg	-0.41	0.66	0.58	-0.15
Netherlands	-0.33	0.43	0.63	-0.02
Portugal	-0.61	-0.02	0.08	0.05
Spain	-0.88	0.61	0.15	0.67
Sweden	-0.28	-0.55	-0.10	0.17
U.K.	0.39	0.39	0.45	-0.05
(+ r value)/14	5/14	8/14	9/14	5/14

* Only correlation coefficients (r's) are shown here. The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

The correlation of competition measures with time over our seven annual periods is shown in Table 5. A negative (positive) value indicates that the competition improved (worsened) over time. The net interest margin with only one positive correlation (Netherlands) with time out of 14 countries indicates improved competition for Europe while for the majority of countries the other four measures rose, suggesting reduced competition. Thirteen of the 14 countries experienced a reduction in net interest margins while 7 to 14 countries experienced a rise in their Lerner index, their ROA, their H-statistic, and their HHI market concentration measure. This shows yet again that all five indicators may not say the same thing.[10]

While the general rise in market concentration (HHI) across countries in Europe suggests that markets are possibly becoming somewhat less competitive, this is not confirmed unless we also see a rise in realized returns, such as a corresponding rise in the various mark-up and profitability measures in Table 5. In fact, the Lerner index did generally rise while the ROA was split between rising and falling over the period. However, the inference that competition may have lessened in Europe is inconsistent with the behaviour of net interest margins (NTMTA) which fell in all but one country.

[10] With only seven annual observations per country, the results in Table 5 should be treated with caution and the focus should be more on the sign of the correlation than on the size.

Since the net interest margin looks only at the net interest return while the Lerner index and ROA are more comprehensive and include non-interest (off-balance-sheet and fee) returns and non-interest (operating) cost, it may well be that competition in the traditional deposit and loan markets rose (reducing the net interest margin) while bank expansion into newer areas of business and the effect of technical change in reducing operating cost would be consistent with the rise in the Lerner index and the return on assets.

TABLE 5: CORRELATIONS OF COMPETITION MEASURES WITH TIME*

(Annual Data 1995-2001; n = 7)

	Four Non-Structural Measures:				One Structural Measure:
	NTMTA	LERNER	ROA	H-STATISTIC	HHI
Austria	-0.91	0.64	0.01	0.70	-0.16
Belgium	-0.95	-0.05	-0.36	-0.80	0.94
Denmark	-0.86	-0.51	-0.77	0.72	-0.05
France	-0.95	0.88	0.94	-0.74	0.91
Germany	-0.97	-0.89	-0.99	-0.80	0.60
Greece	-0.86	0.84	0.18	0.98	-0.68
Ireland	-0.92	-0.36	-0.45	-0.83	-0.83
Italy	-0.93	0.75	-0.52	-0.64	-0.24
Luxemburg	-0.76	0.87	0.80	-0.32	0.88
Netherlands	0.19	0.78	0.58	-0.56	0.61
Portugal	-0.93	0.63	0.44	0.68	0.75
Spain	-0.97	0.81	0.38	0.79	0.87
Sweden	-0.98	-0.68	-0.42	-0.49	0.38
U.K.	-0.98	-0.88	-0.58	0.18	-0.36
(+ r value)/14	1/14	8/14	7/14	6/14	8/14

* Only correlation coefficients (r's) are shown here. The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

If this explanation is accepted, then only the net interest margin would correctly indicate the change in competition for traditional banking loan and deposit services in Europe while the Lerner index and ROA may reflect less competition in non-traditional banking services and more pricing power in this area. After all, non-traditional sources of revenue from off-balance-sheet activities will raise revenues much faster than costs and leave traditional banking output (total assets) almost unchanged. This would be consistent with an apparent rise in pricing power derived from the H-statistic, which due to its small but consistent variation with time had a positive and large correlation coefficient. The concurrent rise in the concentration measure HHI is then likely to be reflective of the wave of banking mergers associated with these new activities rather

than indicating a reduction in competition in traditional banking services. The following section goes further in trying to untangle the relationships among the various competition measures.

4. Determinants of Differences in Cross-Country Competition in Banking

4.1. Is One Competition Measure Strongly Explained by the Other Four?

It has been shown earlier that the four non-structural measures of competition can be re-expressed as functions of the ratio of gross banking profits (before losses and taxes) to assets. If the different manipulations needed to transform each of these measures into a common measure of profitability are not very important to predicting competition, then in principle some sort of weighted average or factor analysis composite of these separate measures may be a way to reflect better market competition than relying on only one indicator for this assessment. Such an arrangement would likely be more successful if the R^2 from regressing any one of our competition measures (CM_i) on the remaining measures ($4CM_j$, $i \neq j$) was reasonably large.

TABLE 6: EXPLAINED VARIATION (R^2) AMONG COMPETITION MEASURES*

($CM_i = f(4CM_j , i \neq j)$)

	Across 14 Countries	Germany, France, Italy, Spain	Within 1 Country, Spain
NTMTA	.34	.35	.41
LERNER INDEX	.23	.19	.64
ROA	.34	.37	.61
H-STATISTIC	.10	.05	.22
HHI	.06	.07	.32
Sample Size	13,384	11,375	616

* All values are coefficients of determination (R^2). The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

As shown in Table 6, this does not seem to be the case. This holds whether the specified relationship is performed using all 14 EU countries, only just four of the largest countries (Germany, France, Italy, and Spain), or just one country (Spain). The greatest similarity among the five competition measures across the 14 countries seems to be the net interest margin (NTMTA) and the ROA with the other four indicators where 30% to 34% of their variation is "explained" by the other measures. The same is

true when the analysis focuses on only four large countries (Germany, France, Italy, and Spain). When only one country is examined (Spain), however, over half the variation in all but the net interest margin is explained by the other measures. These results confirm, from a different perspective, the lack of consistency among competition measures--both within and across countries in Europe.

4.2. Determinants of Differences in EU Bank Competitive Behaviour, 1995-2001

Competition measures can be affected by country-specific influences and thereby distort cross-country comparisons. ~~One influence is the size of the country which can affect the concentration of the national banking market as reflected in the Hirschman-Herfindahl index (HHI) since smaller banking markets generally are more concentrated.~~ An influence related to profitability and rates of return concerns differences in cost efficiency among countries. Countries with greater cost efficiency have a lower ratio of operating cost to asset value (OCTA) which, if not controlled for, may otherwise suggest less competition in a market for banking services. Importantly, bank unit operating costs have been falling over time due to the shift to electronic payments and expanded use of ATMs as opposed to more expensive branch offices. As well, banking profits tend to rise when a country is in the upswing of a business cycle (measured by the growth in real GDP--GDPGR) due to expanding loan demand and/or when inflation is high (measured by a cost of living index--COL). However, these two effects are usually temporary and reversed when GDP growth is slow and inflation is low. [11]

Banks provide both traditional loan and deposit services as well as newer non-traditional services such as off balance sheet derivative, option, and other risk management services. From a public cost and benefit standpoint, traditional loan and deposit services are more important than the newer specialized services since traditional activities affect more people and the users are less sophisticated and less likely to have the opportunity to shop around for a better price. This influence is partially controlled for by the ratio of fee income to asset value (FEEINC) since fee revenue is mostly associated with supplying non-traditional services.

[11] For example, Huybens et al. (1999) show that inflation artificially increases banking margins. Demirgüç-Kunt et al. (2004) also note that both inflation and economic growth can influence interest margins. They find that inflation has a positive influence on margins, whereas economic growth has a small negative impact.

Differences in market contestability may also affect the core consistency of competition measures across countries. Four partial indicators of market contestability are: the number of new bank entry applications denied as a fraction of total domestic and foreign bank entry applications (ENTDEN); restrictions on a country's banks' ability to engage in certain activities such as underwriting, insurance, real estate, etc (ACTRES)[12]; the share of foreign bank ownership in a country (FBANKOWN) approximated by the fraction of the banking system's assets that is in banks that are 50% or more foreign owned;[13] and the ratio of the value of stockholdings to GDP (STOCK) which indicates the degree to which business funding is dependent on banks verses equity financing. Lastly, a dummy variable for the type of bank (commercial, savings, or cooperative) was also specified (TYPEBANK).

TABLE 7: EXPLAINING COMPETITION MEASURES ACROSS 14 COUNTRIES IN EUROPE*

	Four Dependent Variables:			
Independent Variables:	NTMTA	LERNER INDEX	ROA	H-STATISTIC
Intercept	.022	.150*	.006*	-.610*
Cost Efficiency (OCTA)	-.001*	-.051*	-.002*	.004**
Growth in Real GDP (GDPGR)	-.187*	-.147*	.032*	-2.56*
Inflation Index (COL)	.197*	.194*	.098*	-1.23*
Share of Fee Income (FEEINC)	.302*	3.91*	.368*	.817*
Dummy for Type of Bank (TYPEBANK)	.001*	-.000	-.001	.013*
R^2	.12	.15	.17	.12

* The H-statistic was multiplied by -1.0 so a higher value of all measures implies less competition. Estimates significantly different from zero at the 99% (95%) level of confidence are denoted with * (°).

The full linear specification for explaining non-core differences in competition measures CM_i (i = NTMTA, Lerner index, ROA, H-statistic) across 14 countries is:

(1) $CM_i = a_{Oi} + a_{1i}\,OCTA + a_{2i}\,GDPGR + a_{3i}\,COL + a_{4i}\,FEEINC + a_{5i}\,TYPEBANK + e_i + u_i$

where all the variables have just been defined. The OCTA and FEEINC variables differ by bank, by year, and by country while the COL and GDPGR variables differ by year and by country. The variables ENTDEN, ACTRES, FBANKOWN, and STOCK are limited and only vary by country. The last term in (1), $e_i + u_i$, is a composite error term

[12] The measure varies from 4 to 16, where higher values indicate greater restrictions.
[13] These contestability measures are from Barth, Caprio, and Levine (2004).

and is discussed further below. The results of the four OLSQ regressions are shown in Table 7 for 14 countries (n = 13,384) and in Table 8 for the same 4 large countries noted above (n = 11,375).[14]

TABLE 8: EXPLAINING COMPETITION MEASURES ACROSS 4 COUNTRIES IN EUROPE*

n=11.375

	Four Dependent Variables:			
Independent Variables:	NTMTA	LERNER INDEX	ROA	H-STATISTIC
Intercept	.002	.141*	-.001*	-.604*
Cost Efficiency (OCTA)	-.001*	-.043*	-.001*	.001
Growth in Real GDP (GDPGR)	.-047*	.227*	.066*	-0.876*
Inflation Index (COL)	.243*	.313*	.095*	-0.928*
Share of Fee Income (FEEINC)	.318*	4.240*	.435*	1.252*
Dummy for Type of Bank (TYPEBANK)	.001*	-.003*	.000*	-.002
R^2	.13	.19	.20	.21

* The H-statistic variable was multiplied by -1.0 so a higher value of all measures implies less competition. Estimates significantly different from zero at the 99% (95%) level of confidence are denoted with * (°). With an intercept and four country specific variables, but only four countries, the STOCK variable was deleted to eliminate perfect collinearity.

Looking only at significant relationships in Table 8, ~~greater market concentration is associated with a higher Lerner index, a larger ROA, and a higher H-statistic~~. Consistent with the so-called "efficient structure" hypothesis that higher bank profits may (at least in part) be the result of efforts to reduce costs as well as the exercise of market power, the specification of unit operating cost was negatively associated with the net interest margin, the Lerner index and the return on assets. As noted above, unit operating costs have been falling in Europe (c.f., Humphrey, et al., 2006) and this reduction reflects improvements in operating cost efficiency. The growth of real GDP seems to negatively affect the net interest margin and the H-statistic but raise ROA and the Lerner index while inflation raises the interest margin, ROA, the Lerner index but lowers the H-statistic. Non-traditional banking activities, as measured by the importance of fee income at the bank level, are positively associated with the four competition measures.

[14] A fixed or random effects model is not appropriate here as we wish to determine the influence of the specified variables alone without also incorporating dummy variables to reflect unknown country or bank-specific influences.

~~A higher fraction of bank entry applications denied or more restrictions on banking activities would be expected to worsen competition. While only 4 of the 8 parameters were significant, the expected outcome occurred in all 4 cases. Similarly, greater foreign bank ownership and larger stock markets would be expected to improve competition, lowering the competition measures. However, this only occurred in 2 out of the 5 cases where the relationship was significant.~~

Overall, for the 14 countries only about 20% of the variation in the four competition measures was "explained" by equation (1). The most important influences appear to be cost efficiency and fee income~~, and restrictions on new entry and activities~~. For the 4 countries shown in Table 8 (France, Germany, Italy, and Spain), the explanatory power is basically the same (around 20%) and the important influences are cost efficiency and fee income. All the other influences are mixed or of the wrong sign when significant.

We can conclude the following from this explanatory analysis. Differences in ~~contestability,~~ real output growth, and inflation all appear to have only a weak expected influence on the non-structural measures of competition~~, although restrictions on entry and activities can be relatively important~~. In contrast, differences in cost efficiency, fee income from non-traditional services, ~~and (less so) the structure of the market~~ need to be considered when assessing the level of banking market competition across countries.

While this section has analysed a variety of factors that are believed to be important in explaining competition in banking markets a major concern relates to the limited explanatory power of these relationships suggesting that 'other' elements are important in explaining competition in European banking markets. The following section seeks to investigate this further by suggesting a new approach to the measurement of banking competition by focusing on these 'missing variables'.

5. Deriving a Separate Indicator of Bank Pricing Power

It is one thing to point out that banking market-specific differences in cost efficiency, non-traditional activities, market concentration, and perhaps contestability, real output growth, and inflation, should be considered when assessing the predictions of bank pricing power and quite another to actually adjust competition measures for these influences. Not having detailed cost accounting data, our approach to making such an adjustment relies on developments in the frontier efficiency literature. In this regard, the expression $e_i + u_i$ in (1) is a composite error term with e_i representing random error

while u_i reflects the unexplained portion of each competition measure (CM_i) which we suggest reflects a measure of bank pricing power after it has been adjusted for the statistically associated effects of (1) cost efficiency, (2) non-traditional banking activities, ~~(3) market concentration, (4) possible effects from contestability,~~ and (3) temporary changes in bank pricing power due to the business cycle and inflation. In effect, we "subtract" the influences associated with the independent variables in equation (1), and shown in Table 7, from each of the competition measure dependent variables.

TABLE 9: CORRELATIONS BETWEEN AVERAGE UNADJUSTED (CM_i) AND ADJUSTED (PPM_i) COMPETITION MEASURES FOR EUROPE*

(First column unadjusted values; Second column adjusted values; n = 14)

	NTMTA	LERNER INDEX	ROA	H-STATISTIC	HHI
NTMTA	1.00				
LERNER INDEX	.68 .74	1.00			
ROA	.55 .77	.66 .63	1.00		
H-STATISTIC	.48 .24	.24 .13	.33 .32	1.00	
HHI	.07 -.01	.39 .17	.62 .36	.26 .38	1.00

* All values are correlation coefficients (r). The H-statistic was multiplied by -1.0 so now a higher value of all competition measures implies less competition.

Averaging $e_i + u_i$ over time for all sampled banks in each of 14 countries separately is expected to generate an average e_i that approaches zero while the average u_i is expected to yield a truer indicator of the level of average bank cross-country control over market price.[15] As our goal is to adjust the measured level of our four competition measures, rather than only make relative comparisons as is done in the efficiency literature, the intercept of each estimated equation is added to the averaged residual for each equation so that only the effect of the independent variables is "subtracted". Denoting the estimated intercept plus the averaged composite error term $e_i + u_i$ as PPM_i (a pricing power measure), the correlations among these adjusted competition measures are shown in Table 9 (the second part of each column). The correlations among these competition measures before they are adjusted (the first part of each

[15] This approach is taken from the so-called 'distribution-free' application that is used in the efficiency frontier literature, where the u_i term is presumed to reflect the average unspecified cost or profit inefficiency "left over" and unexplained in a cost or profit function estimation. This is sometimes referred to as 'core inefficiency'. Berger (1993) provides a good discussion of this procedure, as do many other researchers in this area. Borrowing from this approach we assume a composite error term composing random error e_i and another term u_i that reflects the unexplained portion of each competition measure not explained by the independent variables in the regression. So as to decompose the composite residual into its two components we assume that random errors are stable over time and average out to zero. Simply, the random error disappears leaving u_i.

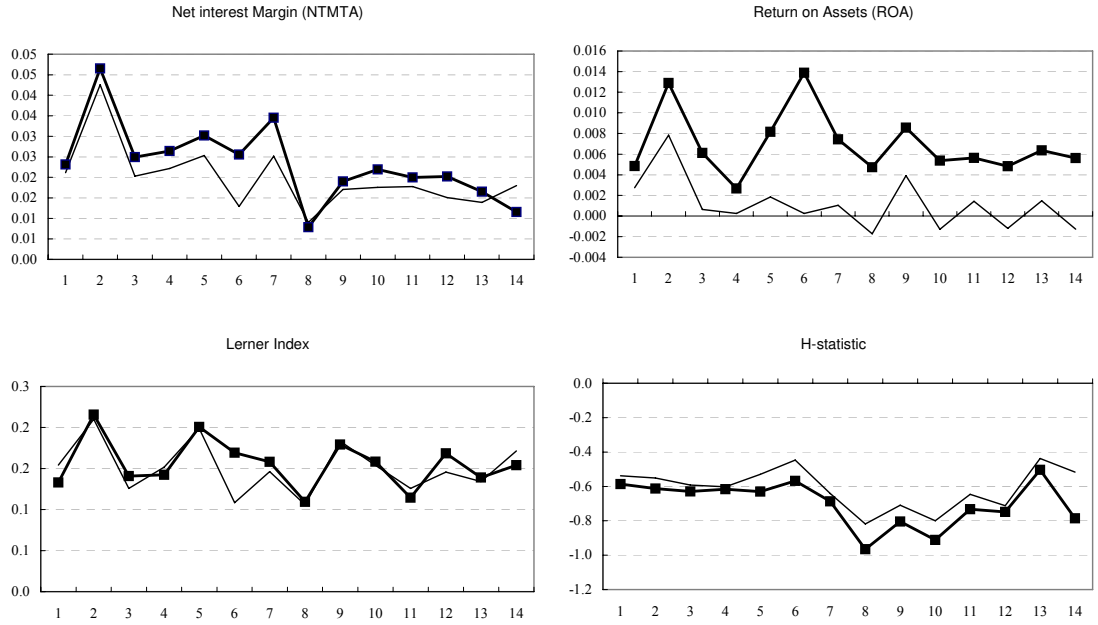
column) were presented earlier in Table 2 and are repeated here to see if our adjusted measures (PPM) may be more consistent than before. Greater consistency occurs when the correlation coefficient (r value) in the second part of column is a higher positive value (or less negative) than the value shown in the first part of the column. Out of 10 possibilities, 7 show an improvement in consistency although the empirically important improvements are restricted to the relationship of the net interest margin with the Lerner index and ROA measures. The H-statistic is still very weakly related to the other measures and, since the HHI measure was one of the influences "subtracted" to derive our adjusted competition measures, its correlation with the other measures is worse (as expected).

The effect of the adjustment we propose is seen better when the unadjusted values of each CM_i are plotted across 14 countries in Figure 1 (the lines with boxes) and compared to the adjusted PPM_i values (the solid lines). From left to right, the countries in each figure (denoted as 1 to 14 on the X-axis) are: Belgium, Denmark, France, Germany, Spain, Greece, Italy, Luxembourg, Netherlands, Portugal, UK, Austria, Sweden, and Ireland. The pricing power portions of the net interest margin (NTMTA), the Lerner index, the return on assets (ROA), and the H-statistic are all either somewhat or markedly lower and, in some cases, more similar in their cross-country variation than are the standard unadjusted measures. Since in all cases a higher value of any of the four competition measures would indicate less competition, the pricing power values for all of the competition measures suggest that actual price competition in our 14 country banking markets may be stronger than what would be otherwise inferred with the unadjusted--and typically applied--competition measures.

Using the unadjusted competition measures to approximately rank the 14 countries in terms of their apparent degree of competition across all four of the non-structural measures shown in Figure 1, the banking markets of Sweden and Luxemburg (with the lowest unadjusted values) would represent the most competitive while Denmark, Spain, and the Netherlands (with the highest values) would be the least competitive. Using the adjusted competition or pricing power measures (PPM), Sweden (again) and Greece would be the most competitive. The least competitive would be Denmark and Spain (both again). At the extreme ends, the country competition rankings are not changed much by our adjustment. The main effect of the adjustments we make is to suggest that banking markets in Europe are seemingly more competitive than the standard measures would indicate. This is understandable since our purpose was to try to "subtract" the apparent effects of cost efficiency, market structure, and non-traditional banking services from the non-structural measures of competition.

FIGURE 1: AVERAGE UNADJUSTED (CM_i) AND ADJUSTED (PPM_i) COMPETITION MEASURES FOR EUROPE

(i = NTMTA, LERNER, ROA, H-Statistic; n = 14 countries
Unadjusted =lines with boxes; Adjusted = solid lines)



6. Conclusions and Policy Implications

Many studies have attempted to determine the degree of competition in US and European banking markets. The vast majority have made this assessment relying upon only one of the various measures developed for this purpose. As we demonstrate here for a cross-section of 14 European countries over 1995-2001, our comparison of five well-known indicators of banking market competition often give conflicting predictions of competitive behaviour across countries, within countries, and over time. These five measures--net interest margin, Lerner index, returns on assets, H-statistic, and HHI market concentration--are only weakly related to one another. Four measures are weakly positively related to each other while one is negatively related. The measures were computed for 14 countries using a balanced panel of 1,912 banks over seven years (giving 13,384 observations).

The essence of our results can be simply illustrated. Using average values across countries, the coefficient of determination (R^2) between net interest margins and the Lerner index, between the Lerner index and the return on assets (ROA), and between interest margins and ROA are only .46, .44, and .30, respectively. Other relationships are weaker still. If these pair-wise relationships were .50, then effectively only 50% of

the time would these measures contain the same information for assessing market competition. These and other results detailed in the text suggest that cross-country comparisons of banking competition in Europe lack consistency and may be unreliable as presently constructed. Our set of competition measures are treated in the literature as being more or less substitutable but we find that the determination of competition may differ depending on the measure chosen to assess it. Thus conclusions regarding competition should be shown to be robust by utilizing more than one measure. Our finding of only a weak positive association among the various competition measures makes it more difficult to determine with confidence the overall state of banking market competition in Europe, to assess the effects of deregulation on competition as some studies have attempted, or for policy makers to judge the likely effects of prospective mergers.

In attempting to identify some of the reasons why our competition measures differed in their predictions, we found that cost efficiency~~, a measure of market structure (HHI)~~, and an indicator for non-traditional banking services were the most important influences that are currently bundled into and reflected in standard measures of market competition. Business cycle effects, inflation,~~ and two measures of market contestability~~ were unimportant ~~but two indicators of restrictions on banking entry and activities seemed to have some consistent explanatory power~~. These results were obtained by applying a composed error regression model to our four non-structural competition measures (net interest margin, Lerner index, ROA, and the H-statistic). The composed error approach enabled us to try to identify and "subtract" the effects of cost efficiency, etc., from our set of standard competition measures and obtain an estimate of underlying bank pricing power in European markets.

Using the implied measure of bank pricing power, the most competitive banking market in Europe appears to be in Sweden while the least competitive appears to be in Denmark and Spain. Overall, the pricing power indicator we derive suggests that competition among European banking systems may well be more substantial than implied by traditional measures and analysis. At a minimum, it seems prudent to adjust competition measures for contemporaneous cost efficiency and the effects associated with non-traditional banking services. This presumes that competition policy should be focused on the assessing competition in traditional deposit and loan services as this is where a lack of competition affects the most people as well as economic growth.

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APPENDIX

TABLE A1: NUMBER OF BANKS BY COUNTRY AND YEAR (1995-2001)

Country	Each Year	Total
Austria	41	287
Belgium	28	196
Denmark	62	434
France	184	1,288
Germany	1,155	8,085
Greece	8	56
Ireland	6	42
Italy	198	1.386
Luxembourg	61	427
Netherlands	10	70
Portugal	6	42
Spain	88	616
Sweden	7	49
United Kingdom	58	406
EU	1,912	13,384

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