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How Competitive Is Croatia's Banking System?

CROATIAN NATIONAL BANK

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Abstract

Since 1998, the number of banks operating in Croatia has decreased substantially, and some measures of concentration, including the CR5 ratio and the Herfidahl-Hirschman Index, have grown. Nonetheless, interest rates and interest rate margins have fallen, and the range of products and services available has increased dramatically. This paper reviews both the industrial organization literature in general and the literature on bank mergers in particular to show that market structure does not uniquely determine the degree of competition; increased concentration and increased competition are in fact theoretically quite compatible.

For these reasons, the degree of competition must be studied empirically through analysis of market outcomes. In accordance with this, in its empirical sections, the paper provides several tests of the level of competition in Croatia's banking system. According to the Panzar-Rosse h-statistic, the level of competition in Croatia is quite similar to other European banking systems. The Lerner Index method, which provides a rigorous estimation of mark-ups, shows increases in competition during 1995-97 and 1999-2001 or 2002, coupled with strong growth in efficiency. These results, along with decompositions of profitability gains, suggest that competition has indeed increased, but that Croatian banks have increased efficiency enough to maintain strong profitability in the face of increasing competition.

JEL: G21, L51, G28, D40, B21

Key words: banking, competition, Croatia, market structure, mergers

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1 Introduction

Since 1998, the number of banks operating in Croatia has decreased substantially. As of June 1998, there were 61 banks and 36 savings banks in operation; by August 2005, only 34 banks were left. In addition, the share of banking assets controlled by the 5 largest banks has risen from 57.6% at the end of 1998 to 74.3% at the end of 2004. And bank profits have risen since the losses posted in 1998; return on average assets was a healthy 1.6% in 2003 and 1.7% in 2004.

However, the fact that concentration has increased, and that profits have recovered from their cyclical lows, does not prove that the Croatian banking system is less competitive in 2005 than it was in 1998. On the contrary, a good deal of casual evidence suggests increased competition over the period: interest rates have fallen, banks seem to continually be offering new products, and bank advertising constantly seems to escalate. Furthermore, the number of banks participating in the whole national market, and not just in certain regions, has grown from just 3 in 1997 to 10 in 2002. The aim of this report is to examine this apparent paradox by studying the effects of increased concentration on the Croatian banking market, and by providing empirical evidence on the evolution of competition in the market.

The classical theory of industrial organization connects increased concentration with increased market power. Theories of oligopoly developed between the 1930's and 1950's suggested that concentration would necessarily lead to excess profits and socially undesirable outcomes. However, these ideas are no longer universally accepted. As early as the 1940's, Schumpeter (1943) suggested that firms with market power would have greater incentives to innovate, thus challenging the notion that oligopoly automatically had negative implications for economic welfare. By the 1960's, an important body of literature had grown suggesting links between firm size and firm efficiency. "Big" was no longer necessarily "bad".

Finally, in the 1980's, the theory of contestable markets showed the importance of potential entry; even the threat of entry could produce competitive outcomes in markets. And the introduction of game theory into microeconomic analysis allowed a much more rigorous and subtle analysis of strategic interaction. This led to the realization that the degree of competitive behavior in an industry is not uniquely determined by industrial structure in the sense of the sheer number of players or the value of a particular concentration index. For this reason, one

cannot simply conclude that a high level of concentration, or an oligopolistic market structure, leads to prices far above marginal costs and extra profits.

A simplified example may help to illustrate why concentration and competition cannot necessarily be mapped uniquely onto each other. Consider the same industry producing the same product in two different economies. In economy A, the product is produced by 5 equal-sized producers who are present throughout the whole economy. In economy B, the product is produced by 100 equal-sized producers each of which holds a local monopoly in an exclusive territory. By the CR5 concentration index, which measures the share of the five largest producers, the industry in economy A has a 100% concentration ratio. The industry in economy B has a 5% CR5 ratio. But it is clear that the industry in economy A is actually more competitive.

The straightforward conclusion from this argument is that the degree of competition in any market must be measured by direct tests of economic variables, rather than inferred from measures of concentration. For this reason, this paper will examine various empirical measures of competition in the Croatian banking market as a way to answer the question, "How competitive is the Croatian banking market?"

Summarizing the empirical findings below, the most conclusive test of competitive behavior, the Panzar-Rosse test, suggests that the Croatian banking system is approximately as competitive as or more competitive than several other European banking systems, including those of France, Germany, the Czech Republic, Denmark, Italy and Latvia. However, according to other evidence, in particular the Lerner Index, which measures price mark-ups, the evolution of competitiveness over time is somewhat less clear, with signs of strong improvements in competitiveness in 2000-2002, and some deterioration in 2003 and 2004. However, there is much clearer evidence of increased efficiency over time.

Overall, the evidence suggests that competition has not been endangered and may have actually been increased by the recent consolidation of the banking system. At the same time, caution is needed in assessing any further mergers, since concentration is already high. And an active pro-competitive regulatory policy will be needed to preserve and enhance competition.

The paper is structured as follows: the second section deals with theoretical issues, starting with a survey of industrial organization theory, then turning to specific issues in the banking industry, including the motivations for and effects of bank mergers. The third section contains the empirical evidence, starting with "casual" evidence about interest rate trends and interest rate dispersion. After that, survey data on competition are examined, followed by simple regression models. Two formal tests, the Panzar-Rosse and the Lerner Index, are then undertaken. Finally, a decomposition of efficiency growth is offered. Conclusions are found in the fourth section.

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2 Theoretical Background

2.1 The Evolution of Industrial Organization Theory: A Brief Survey

Although banking competition differs in important ways from competition in other industries, due to the importance of prudential issues and systemic risk, it will be useful to quickly review the evolution of the theory of industrial organization in general so as to better situate the debate on banking. We need to make this review to understand why the increasing degree of concentration seen in the Croatian banking market does not necessarily imply that this market is becoming less and less competitive.

The seminal works on the effects of concentration and the behavior of oligopolies were undertaken in the 1930's and 1940's. Chamberlain (1929, 1933), Hall and Hitch (1939) and Sweezy (1939) showed that oligopolies could be stable and could limit competition. They introduced the idea of strategic behavior, that is, the idea that competitors in an industry may act based on analysis of the behavior of other competitors, and competitors would use this analysis to influence the final outcome. For example, in contrast to a perfectly competitive industry where firms would be unable to influence output price and would be passive "price takers", firms in oligopolistic industries might avoid price cuts so as to prevent all-out price wars that would harm all industry participants. The result would be "tacit collusion": an implicit agreement to charge the monopoly price, even though no explicit communication between the firms might occur. Of course, such an outcome would be undesirable for society as a whole, since it would result in inefficiently high prices and a decrease in consumer welfare.

Bain (1951) undertook the crucial empirical work that supported this view of oligopoly. His regressions of profitability by industry seemed to show clearly that more concentrated industries had higher profits. This translated into a welfare analysis implying that limiting concentration through regulatory intervention would benefit consumers more than it would hurt producers, and thus would raise social welfare.

Bain's findings were central to the formation of regulatory policy in the United States, the country most active in developing competition policy. Policy was suspicious of concentration, and size was often presumed to be an indication of unhealthy market power. Such arguments were strengthened by Bain's conjecture (Bain 1949, modeled in Bain 1956, Sylos-Labini 1962 and Modigliani 1958) that oligopolies could practice "limit pricing" – pricing lower than the profit maximizing level, but still above marginal cost, so as to make the entrance of potential competitors unprofitable. In other words, the limit price argument seemed to imply that barriers to entry would be generally effective unless anti-trust policy actively forced increased competition.

Bain (1956) identified four kinds of barriers to entry that would restrict entry and allow incumbent firms supranormal profits. The barriers enumerated were economies of scale, absolute cost advantages, product-differentiation advantages

due to incumbents' experience with creating brand recognition and loyalty, and capital requirements high enough to make it difficult for new firms to amass the needed funds, or attract loans (since the new firm would lack experience in the industry and thus have difficulties persuading creditors to lend to it).

Bain's view was challenged, particular by economists from the University of Chicago. The "Chicago School" was noted for its advocacy of free markets and its skepticism about regulation. Its leading exponent in the field of Industrial Organization was Joseph Stigler, who challenged Bain's definition of barriers to entry. Stigler (1968) suggested that a barrier to entry is a cost that is borne by firms seeking to enter into the industry but is not borne by those already in the industry. This means, for example, that economies of scale do not constitute a barrier to entry: if the new firm could build a factory as big as the existing firm's, the new firm would not have a cost disadvantage. And there would be no policy reason to limit firm's size in the presence of economies of scale; on the contrary, larger scale would be more efficient and more socially beneficial.

Von Weizsacker (1980) went further than this, arguing that a barrier to entry is a cost of producing that must be borne by a firm entering the industry, but is not borne by firms already in the industry, and that implies a distortion in the allocation of resources, from the social point of view. This definition highlights the question of social welfare, which is implicit in Bain's definition as well. But Von Weizsacker wants to point out that barriers to entry can be either beneficial or harmful to social welfare. (See also McAfee, Mialon and Williams 2004.)

Cases of harmful barriers to entry are not hard to find. For example, a cartel agreement enforced by law would be socially harmful. Cases of beneficial barriers to entry might seem theoretical, but in fact U.S. regulatory policy in several industries (airlines, trucking, banking) limited entry with just this in mind.

In short, those challenging Bain's limit-pricing view argued that the causes of oligopoly might not be abuses of size and market position, but natural economic forces such as economies of scale and successful product development (Demsetz 1973 and Peltzman 1977 provide key contributions to this literature.) As a result, there can be no presumption that oligopoly diminishes social welfare, and no presumption that oligopoly should be reversed by regulatory means.

This debate was never definitively resolved, mainly for the reason that the actual situation differs considerably from industry to industry. In addition, by the 1960's, it had become clear that the large firms in advanced economies were less and less committed to a single activity or industry, and more and more likely to form into "conglomerates" crossing industry lines. This fact eroded Bain's fourth barrier to entry, the difficulty a new entrant would have in raising capital. It also shed new light on the other barriers as well, since a large conglomerate that previously had not operated in an industry may still accumulate brand loyalty and large scale, and thus find it easier to "jump over" entry barriers. In short, a new kind of competition was emerging.

This new competition was recognized by economic theorists, and received perhaps its clearest exposition in the theory of contestable markets, expounded by

Baumol et al (1982). The theory of contestable markets introduced the notion that potential competition, not just actual presence of competitors, could affect the behavior of industry incumbents. The existence of a threat that new firms will enter if incumbents raise prices can create outcomes very similar to fully competitive markets even with a small number of firms operating in the industry. The key is a credible threat of potential entry.

The theory of contestable markets provided the intellectual justification for a major wave of deregulation in the United States and many other advanced countries in the 1980's. The point was that even industries with a relatively small number of players could behave competitively. This insight further weakened the traditional linkage of oligopoly with limited competition and rent-seeking behavior.

This new view had implications for a set of industries that had actually been regulated to decrease, rather than increase, competition. For example, in air transport, trucking and banking, to name some of the more important examples, regulators had artificially created barriers to entry during the 1930's to prevent price wars and stabilize profits. This strategy for fighting the Great Depression was based on the notion that unlimited competition eroded profits to the point where necessary investments (for example in better, safer airplanes or in lower-yield but less risky bank assets) were not undertaken. "Excessive" competition therefore not only led to failure of firms during hard times, but was linked with undesirable social outcomes.

Under the contestable markets approach, regulators came to believe that free competition would be feasible in the previously entry-restricted industry. The best illustration of the new approach of the 1970's is the airline industry. While the regulatory limitation of the industry had allowed the remaining carriers to achieve profitability and stabilize themselves in the 1930's, over time, airline profits rose substantially as the price of tickets grew rapidly. By the 1970's, U.S. authorities decided that consumers were suffering from regulatory limitation of competition. When entry was liberalized, air ticket prices fell drastically. Many of the new entrants failed, but new companies continued to form, and prices remained substantially lower in real terms than before deregulation. However, the financial situation of the largest carriers became precarious, and the terrorist attacks on September 11, 2001 sent several large carriers into bankruptcy. In addition, the emergence of budget carriers has created new challenges for the industry. At the moment, there seems to be little intellectual or political support for reregulation, but at the same time the industry is clearly in crisis and will probably look rather different a few years from now.

Another major advance in industrial organization in the 1980's and 1990's came from the application of game theory to the analysis. Game theory can be broadly summarized as a mathematical technique to model strategic behavior: how one competitor anticipates the moves of the other, and what the resulting outcomes might be. The case of limit pricing is a classic example of the application of game theory to industrial organization analysis. In the original analysis by Bain, Sylos-Labini and Modigliani discussed above, incumbents can prevent entry sim-

ply by lowering their prices to the point where entry would not be profitable at the prevailing price level. This model includes strategic behavior, but the analysis of this behavior is inadequate. A game theoretic analysis of the same problem alters the conclusion. Game theory allows the analysis to take into account the credibility of the incumbent's threat to lower prices upon the competitor's entry, and it allows the analysis of various strategies by both parties. The incumbent can try to use low prices to signal that demand is weak or that the incumbent's costs are low, but the entrant may be able to "call the incumbent's bluff" and discover the incumbent's true nature. Depending on the characteristics of the firms, the markets and the technology available, there are combinations of actions that result in successful prevention of entry, and there are combinations of actions that result in the failure of the limit pricing strategy. No general conclusion can be drawn. For better or worse, this is a common characteristic of game theory: multiple solutions or equilibria may exist, and the analyst cannot come to a simple, unambiguous conclusion in many cases. (See Milgrom and Roberts 1980 for a pathbreaking analysis, and Tirole 1988, chapter 9 for an extensive review of subsequent literature.)

Furthermore, Sutton (1991), in an important contribution to the game-theoretic literature, shows how the degree of price competition in an industry may influence the degree of concentration. In fact, if competition is "tougher", equilibrium concentration will be higher. The reason for this is that tough price competition decreases profits, and makes entry less attractive. This finding completely reverses the causation proposed in the classical Structure-Conduct-Performance paradigm; instead of high concentration leading to high profits, as in the SCP paradigm, we now have tough competition and lower profits leading to higher concentration!

The new industrial organization theory is much richer than its predecessors, offering more nuances and a much wider range of outcomes. At the same time, this means that the conclusions for regulatory policy are much less clear. The ability of incumbents to use market power to exclude entrants and achieve supernormal profits must be analyzed separately for each industry, based on the characteristics of the industry and the particular firms involved. Also, welfare implications are much more complicated and nuanced. One cannot either say that large firms are good or that they are bad in general. Simple rules that "market share should not exceed x percent" cannot be justified under the new theory. As Tirole (1988, pp. 223) puts it,

> Concentration indices are useful in that they give an easily computable and interpretable indication of how competitive the industry is. However, they have no systematic relationship with economic variables of interest for assessing changes in cost, demand or policy. Furthermore, they are endogenous, so they do not allow simple observations of correlation to be interpreted in a causal way.

To summarize, the contemporary approach to industrial organization stresses that market structure in a given industry is the result of strategic interaction

among firms. Only detailed examination of the characteristics of technology, markets and firm behavior can show whether the market structure is socially optimal. Competition is feasible even in industries with few firms if the threat of potential entry is credible. This means that the actual level of competition must be measured using more complex tools than simple concentration ratios or similar indices. Regulatory limitation of entry tends to be viewed as impeding the growth of efficiency over time and harmful to consumers.

2.2 Industrial Organization Theory and the Banking Industry

Most of the industrial organization theory surveyed above applies directly to banking as well. But to understand what is special about regulation of competition in the banking industry, we must examine the link between competition and bank soundness. Economists have argued that one of the main reasons why banks exist is that they have advantages that allow them to invest more efficiently than individual investors would if they tried to directly find projects to invest in. Banks have been characterized as "delegated monitors" in that individual investors delegate the investment decision and subsequent monitoring to the bank rather than do it themselves. Banks thus specialize in the selection of the most profitable investment projects and borrowers, and also have the knowledge and organization required to monitor borrowers so as to minimize opportunistic behavior and default (Diamond 1984). This implies that banks' performance is especially sensitive to two types of problems: adverse selection in the choice of borrowers, and moral hazard in the monitoring function.

The root of these problems is asymmetric information. With respect to project selection, borrowers of course have an incentive to present themselves in the best light possible so as to increase their chances to get loans. Worse than that, good borrowers are less likely to exaggerate their qualities, because they actually intend to repay and thus will gain little by obtaining credits they are unable to return. Bad borrowers, who would not be terribly upset if they took a credit and failed to return it, have much stronger incentives to exaggerate. Banks' main problem is to distinguish the good from the bad borrowers in a situation in which the borrowers know more about their own characteristics than the banks do.

The most famous illustration of this problem is the Stiglitz and Weiss (1984) model of market-induced credit rationing. Stiglitz and Weiss note that, when interest rates are unusually high, most good borrowers choose not to borrow, since there is little chance of repaying loans at such high rates. Banks are then faced with a borrower pool consisting mainly or even exclusively of bad borrowers who are unlikely to return the loan. The increased adverse selection problem leads to credit rationing, that is, banks turn down many borrowers and actually provide fewer loans than they would with lower interest rates.

With respect to monitoring, the borrower always has more information about how well the project is going and about the likelihood of repayment than the bank. As with project selection, the bad borrower who is not concerned about future

co-operation with the bank has weak incentives to make strong efforts to repay, a moral hazard problem.

High levels of competition can interact with these always-present information problems. For example, with strong competition for customers, banks may be tempted to decrease screening efforts in the selection process, increasing adverse selection and decreasing the quality of their portfolios ex ante.

In a similar fashion, very intense competition might lead banks to cut efforts to monitor borrowers. Schnitzer (1999) provides a model based specifically on the experience of transition countries in which banks faced with a high level of competition and relatively poor borrowers choose to invest little or even nothing in monitoring, partly because other banks are doing the same and banks must meet the prevailing market prices for loans, and partly because the marginal benefit of increased monitoring cost is particularly low. Of course, such a banking system would be highly susceptible to banking crises.

These arguments suggest that high levels of competition can exacerbate problems caused by information asymmetries. In addition, Keeley (1990) makes the very important argument that increased competition can decrease banks' franchise value, and thereby lead to increased risk taking. The argument rests on the observation that limitations on entry such as the separation between commercial bank activities and savings and loans activities in the United States before 1980, lead to an oligopoly situation in which incumbents earn higher profits than firms in competitive industries. For this reason, possession of a franchise (a banking license) is highly valuable. Incumbent banks therefore will be careful not to lose the license, and will keep the risk of their portfolios low enough to make default very unlikely.

However, when competition increases, franchise value is lowered, and banks' incentive to avoid risk-taking is blunted. Thus, all things equal, a more competitive banking system will have lower franchise value and higher portfolio risk than a less competitive one.

Increased competition may also result in increased deposit interest rates. While increased deposit interest rates certainly benefit depositors, if the banks that raise deposit interest rates do so in an attempt to fund high-risk projects, two problems may emerge: first, an increase in overall portfolio risk, and second, a negative externality of higher deposit interest rates for all banks, including those with lower portfolio risk. Keeley (1990) refers clearly to this phenomenon. Murdoch, Hellman and Stiglitz (2000) take the argument a step further, calling for limits on deposit interest rates as a way of preventing this kind of "bidding up deposit rates to fund gambling."

Both the information asymmetry arguments and the franchise value arguments show that increased competition can be linked to increased portfolio risk and potential instability. It would be tempting to conclude from this that competition in banking is not as welcome a phenomenon as it is in other industries, and to design regulation so as to limit competition. Indeed, this was the approach followed by most advanced countries in the period after World War II up through the 1980's.

However, this approach to regulation has been abandoned for the simple reason that there are large benefits to be gained from competition in the banking system. Because deposits and loans are of such fundamental importance to the economy as a whole, competitive pricing brings substantial benefits to almost all economic subjects. In addition, competition can not only improve the prices offered but also increase the availability of banking services. All of this can have a significant positive impact on economic growth and economic welfare, especially if we look at dynamic processes. If liberalization of bank competition were to raise growth even by half a percentage point a year, its effects would become huge over time.

This argument has been formalized by Allen and Gale (2003). They consider a range of cases, and explicitly take into account the cost of banking crises. Nonetheless, they find that the competitive solution is optimal.

Recent studies have provided empirical evidence on both sides of the issue. Beck et al (2003) provide cross-country evidence on the relationship between concentration and the frequency of crisis. They find, in keeping with the arguments made above, that more concentrated banking systems are less crisis-prone, but that, when concentration rises to very high levels, stability starts to decrease. However, this same study finds that tighter entry regulations actually lead to higher probability of crisis, as do regulatory restrictions on bank activities. Also, a more competitive environment in the economy as a whole seems to help countries suffer fewer banking crises.

Demirgüç-Kunt and Detriagache (1997) find that financial liberalization, which includes increased competition as one of its components, is associated with greater risk of crisis. Of course, as with all cross-country studies, these results should be taken with some reserve, for all the particular characteristics of a given country are either covered by the small number of control variables or thrown into a constant term. The constant term can only capture those characteristics of a country that do not vary in time or in correlation with other variables, and thus may not really contain within it also the country specific phenomena relevant to the problem. Nonetheless, it is very important to examine the cross-country evidence to gain some insight into global experience.

At the same time, Ranciere et al (2003) make a very interesting empirical case for the assertion that more liberalized financial systems, while more prone to crisis, produce higher growth over the long-term. More precisely, they show an empirical link between per capita GDP growth and the negative skewness of lending growth. That is, countries that experience infrequent sharp decreases in lending growth (i.e. crises) actually show higher long-term GDP growth per capita. They argue that this result holds because firms in such systems can take on more risk, which allows them to raise their productivity rapidly and grow faster, at the expense of occasional crisis. In their view, this "unstable" growth actually provides a higher level of welfare than slower, steadier growth. Recent papers by Matsuyama (1999), Jovanović (2004) and Francois and Ellis (2003) also suggest that growth strategies that encourage higher levels of innovation and higher levels of risk outperform more conservative strategies.

It should be clear that the optimal level of risk in banks' portfolios is not zero. If it were, banks would only hold risk-free assets such as government paper. While banks would then be perfectly sound, the supply of loans to the economy would be limited, and economic growth would suffer. Thus, the socially optimal bank portfolio must have some risk (see Kupiec and O'Brien 1998 for a clear explanation).

2.3 Scale of Operations and Competition

Thus far, we have discussed the link between competition and risk-taking in banking. In this section, we ask whether large banks have competitive advantages in banking, and also whether there might be a special role for small banks nonetheless. Recent megamergers have resulted in the formation of extremely large international banks, and to speculation that a few large banks might dominate the markets. For example, some have asked whether a handful of players might control European banking markets in the coming years.

One important point to notice about banking is that banking services depend closely on information flows. Banks need to know a lot about their customers in order to evaluate loan applications, and to monitor the probability of repayment. (Repayment itself is easy to monitor.) Much information can be standardized, particular with regard to homogeneous products consumed by large numbers of agents. For example, standard mortgage or automobile loans are taken by very large numbers of people, and statistical analysis can be used to generate models predicting repayment patterns. Such credit scoring models can be used as a low-cost but very effective screening method for large numbers of relatively small loans.

However, not all bank products are homogeneous and offered on a large scale. In fact, one of the defining characteristics of bank lending up to now has been that bank loans rely on lots of specific information about the borrower. This makes the value of bank loans difficult to value on the open market, and limits the possibilities for secondary loan markets. Although such markets have developed for certain kinds of loans, along with credit derivatives that also rely on market appraisal of loan risk, a large part of the banking business remains opaque and resistant to such techniques.

For this reason, a recent study by the Federal Reserve (Brevoort and Hannan 2004) finds that the physical distance between the lender and the borrower is still a major factor in much bank lending. Banks physical presence through "brick and mortar" branches remains especially relevant for small business loans, even in today's internet world. This implies that competition must be assessed in relatively small geographic areas as well as whole countries, because the individual borrower is in most cases reliant on banks in his or her immediate vicinity.

In addition, Berger, Klapper and Udell (2001) argue that small enterprises are "opaque" to lenders, because they are usually not listed on stock exchanges, do not emit tradable debt securities, and often provide only limited accounting disclosure. This means that lenders must have much more direct contact with small firms to assess them, which tends to give small banks operating in the same geo-

graphical areas as the small firms an advantage in working with small firms. Berger and Udell (2002) also point out that the loan officer, who has direct contact with the borrower, becomes especially important in bank relationships with small firms. This favors small banks with relatively "flat" management structures that give loan officers more influence. Stein (2002) reinforces this argument by showing that large banks have trouble transmitting "soft" information about small borrowers through the extended hierarchy of the bank.

Berger, Hasan and Klapper (2003) take a further step, connecting small banks with economic growth. They begin by arguing that greater activity by small enterprises stimulates GDP growth. They then hypothesize that the existence of efficient small banks stimulates small enterprise growth, and provide cross-country econometric evidence that the market share and efficiency of small, private domestic banks has a positive effect on GDP growth. They define small banks as having less than USD 100 million. (Incidentally, the authors find that a higher foreign bank share also raises economic growth, but they suspect that this comes about through foreign banks' effect on overall interest rates and foreign banks lending to large firms and standardized markets.)

Thus, there seem to be strong arguments about the benefits of locally-based banks focusing on the particular needs of small enterprises (what Berger, Hasan and Klapper called "community banks"). This suggests the importance of keeping barriers to entry low. However, one may ask whether mergers will tend to eliminate small banks. Interestingly, in the United States, where deregulation started the earliest and mergers have been very frequent, small banks continue to be formed at a remarkably rapid pace. DeYoung (2003) notes that over a thousand new commercial banks were chartered in the U.S. between 1995 and 1999. Bassett and Brady (2002) document that small banks actually grew faster than large banks in the U.S between 1985 and 2001, despite widespread failures. Furthermore, small banks had higher and more stable profits than large banks. These higher profits were based on higher interest margins, with higher realized loan returns more than offsetting higher deposit interest rates.

At the same time, Allen and Gale (2001) argue that a market structure with a small number of nationwide, large banks with extensive branch networks leads to a higher level of competition and more extensive provision of banking services than a market structure with a large number of localized small banks. This theoretical argument provides economic justification for the ending of the ban on intra-state banking in the U.S. and for the merger movement there. It also supports the EU's move to facilitate cross-border consolidation in the single European market.

Are these two views compatible? That is, could it be true that small banks have persistent advantages in their niche markets, and that small banks will continue to be established "de novo", while the large players consolidate and provide services throughout the whole market?

One way to look at this question is to examine the issue of economies of scale. Empirical investigations do not support the existence of strong scale economies in

banking. Cost function analyses undertaken in the U.S. in the late 1980's and early 1990's suggested that the minimum efficient scale ranges from total assets of USD 100 million to USD 600 million, somewhere in the size category of "medium-sized banks" (Hunter et al 1990, Noulas et al 1990). Costs seemed to increase mildly above that size. However, a later study by Berger and Mester (1997), using the Fourier-Flexible Functional form rather than the Translog, found economies of scale continuing to at least USD 10 billion in assets and possibly more. Also, a recent European study (Altunbas et al 2001) finds scale economies to be relevant to somewhat larger banks with assets between EUR 1 billion and EUR 5 billion. But even these somewhat larger amounts are still far smaller than the size of the larger European and American banks, which now have total assets ranging from USD 100 billion to over USD 1 trillion.

These findings raise many questions. If unit costs are roughly the same for EUR 10 billion and EUR 500 billion banks, why have mergers proceeded so rapidly? Also, if unit costs are constant above a rather low threshold, is the EU mistaken in trying to encourage bank mergers so as to compete with U.S. banks?

These questions were reinforced by early findings from U.S. studies that bank mergers most often led to losses for the acquiring bank. These event studies look at the behavior of the prices of the shares of both acquiring and acquired bank in an "event window" that usually starts about 270 days before the merger and ends 21 days afterwards. The large window before the merger is used to calculate the "normal" behavior of the stock. The window after the merger event is kept short so as to avoid other influences on the stock price.

It should be noted that such studies, while useful, can only examine the short-term perceptions of the market about the merger. Thus event studies certainly cannot be the only method used to evaluate mergers. Still, they do tell quite a bit about mergers. Using the event study method, Houston and Ryngaert (1994) find that, while mergers create positive abnormal excess returns for the shareholders of the acquired banks, they generally created negative abnormal excess returns for the shareholders of the acquiring banks. Furthermore, the gains of the acquired banks approximately offset the losses of the acquirer, so that the share value of the new bank was not significantly different from the share value of the two banks together. Interestingly, however, when the acquirer is more profitable, the total abnormal returns are higher, indicating that markets have more favorable responses to takeovers by banks that are perceived as good banks.

DeLong (1998) further qualifies these results, finding that mergers that resulted in more focused organizations resulted in positive excess returns for the acquirers, while mergers and acquisitions that decreased focus resulted in negative excess returns. That is, mergers or acquisitions that combine banks engaged in similar activities and in similar geographic regions tend to create value (i.e. generate positive excess returns).

However, Cybo-Ottone and Murgia (2000) show significant excess abnormal gains for both acquirers and the acquired in event studies involving European bank mergers. They suggest that less restrictive anti-trust regulation in Europe as

well as the lack of limits on product diversification in Europe (the fact that investment and commercial banking has not been separated, whereas in the U.S. they were separated until the repeal of the Glass-Steagall Act in 1999) account for the better reception of European mergers by stock market investors.

The combination of these cost-study findings that economies of scale cease at a very low threshold, and the event study findings that most mergers destroy shareholder value, posed a significant puzzle for researchers and for regulators. If cost savings were not driving the mergers, and if most diversifying mergers were perceived negatively by the markets, why were banks so eager to merge? Was it all a fad with no rational basis?

There are several possible answers. 1) One argument is that bank mergers are indeed economically irrational and occur due to empire building on the part of managers. Managers may enjoy non-pecuniary benefits from running a larger bank, such as a greater sense of importance and greater social and political influence. Milbourn et al (1999) propose a model in which overconfident managers support mergers because they overestimate their ability to manage larger banks. This creates a sort of peer pressure on other managers, encouraging them to join the merger wave.

The problem with this argument is that it does not really explain why shareholders of the acquiring banks allow their managers to engage in self-interested behavior. If shareholders do not believe that mergers create value, why do managers succeed in pushing mergers through? Flannery (1999) notes that there is evidence that corporate governance is weaker in banks than in other companies, thus perhaps allowing more freedom for managers to pursue their personal interests in banking cases. Indeed, bank CEO's and their teams are usually the ones to lead merger negotiations. Still, as Flannery points out, if CEO's have such an easy time getting what they want from their shareholders, wouldn't it be easier to just negotiate higher pay than engage in risky mergers?

Thus, while managerial empire-building may be part of the answer to the puzzle of bank mergers, it is difficult to believe that this could be the main reason driving so many massive deals. A further piece of evidence supporting this is the study by Diaz Diaz et al (2002), which shows that merged banks display improved performance relative to non-merged banks in Europe in a two-year time horizon, when controlling for a host of other factors. In other words, there is some evidence that bank performance improves after merger. Amel et al (2004) also emphasize that the positive effects of mergers may take several years to be fully apparent. This may explain the difficulties that academic researchers have in finding the effects of mergers in the data, since merger's effects would be easiest to see immediately after the merger, but in fact the effects may be "buried" in longer data series.

2) Another possible explanation that would also be unfavorable from a social point of view is that mergers are mainly driven by the desire to increase market power. In Europe, this could receive tacit or even explicit government support in the drive to create "national champions" in banking.

The question of whether recent mergers have increased the market power of large banks and led to detrimental pricing effects is a controversial one. For the U.S., Berger (1995) provides a very thorough test of competing hypotheses: the structure-conduct performance hypothesis, which suggests that large banks use high market share to generate high prices and high profits, and the efficiency hypothesis, which suggests that banks grow larger because they are more efficient and do not use their market power to generate higher profits. Berger rejects the structure-conduct-performance hypothesis that large banks use market power to generate high profits. However, although he finds that x-efficiency can partly explain profits, he finds that profitability is not very well explained either by concentration or by traditional efficiency measures.

For Europe, Jansen and de Haan (2003) run a set of tests about the relationship between concentration, competition and profitability. For the most part, they reject any relationship between concentration and profitability, thus rejecting the market power hypothesis. They show that the findings of some studies that suggested a link between concentration and profitability, such as Bikker and Haaf (2002), are not robust to changes in sample or indicators. Like Berger, however, they are unable to confirm the efficiency hypothesis either.

Claessens and Laeven (2003) confirm some of the key findings of Jansen and de Haan on an even larger international sample of countries. Importantly, they find no correlation between the degree of competition (as measured by the Panzer Rosse test explained in section 3.4) and concentration as measured either by the HHI or CR5 indicators. This is a very important finding, since it underlines the weaknesses of traditional concentration indicators as measures of competition.

Another way to look at the question of market power is to study whether the process of consolidation and mergers that resulted from deregulation resulted in increased efficiency. Stiroh and Strahan (2003) show that, in the U.S., deregulation has increased the probability that efficient banks will increase market share, and thereby has raised efficiency in the banking industry as a whole. Jayaratne and Strahan (1997) also show that deregulation led to decreased operating costs and lower lending rates, suggesting that the benefits of competition were passed on to consumers.

For Italy, Angelini and Cetorelli (2003) estimate a model of banks' supply and demand functions. They use this to estimate the Lerner Index, which measures the banks' mark-up above costs (see section 3.5 for details). Lower mark-ups would indicate increased competition and decreased market power. Indeed, their results show the Lerner Index falling through the 1980's and 1990's, in line with the increased competition created by deregulation. Thus their findings support the notion that banking sector consolidation in Italy has not increased banks' market power, even though it has resulted in the formation of larger banks.

All these studies have to be taken with a certain amount of caution. General findings that market power has not increased, or that market power is usually not the main reason for mergers, cannot be interpreted to mean that all bank mergers are healthy. Regulators will still have to scrutinize proposed transactions carefully

to prevent abuses of market power, even if the broad thrust of deregulation has produced acceptable results.

3) Another view depends on the distinction between scale economies and x-efficiencies. Scale economies refer to the characteristics of the minimum cost frontier. The existence of economies of scale would mean that larger banks can potentially have lower costs than smaller ones. But in reality, banks operate within the frontier, and their costs have been found to exceed the minimum set by the frontier by 20-25% on average. This inefficiency is referred to as "x-inefficiency" because it results from all sorts of inefficiency in operation. Berger and Humphrey (1991, 1997) find that these x-inefficiencies are far more important in explaining relative bank performance than scale economies or diseconomies. They further argue that technical inefficiencies (using too many inputs) are the main culprit for higher costs, rather than financial inefficiencies such as paying higher deposit interest rates than necessary.

How is this relevant to mergers? The existence of large x-inefficiencies suggests that mergers may result in increased efficiency if the acquiring bank is able to improve the x-efficiency of the acquired banks business. In other words, if the acquirer has better cost management abilities, then it may be able to lower costs at the acquired bank and thus at the merged bank as a whole. There is some anecdotal evidence for this, since many U.S. bank mergers have resulted in large numbers of layoffs.

Unfortunately, while this argument is logical, it does not seem to hold true in practice in many mergers. Peristiani (1997) studies the cost-efficiency of a large sample of U.S. mergers in the 1980's and finds no evidence that mergers improved cost-efficiency. Stiroh and Strahan (2003) suggest that the reason for this is that many mergers in the U.S. involved large banks buying good local banks as a way to gain access to new markets. In other words, cost improvement simply may not have been the motivation for many U.S. mergers.

Of the European studies, Vander Vennet (1996) is of particular interest. He shows that two types of mergers result in improvement in cost-efficiency: mergers of relatively equal-sized banks in the same country, and cross-border acquisitions. Mergers of unequal sized domestic banks, however, seem to not result in cost improvements, and may be driven by managerial motives discussed above.

4) Another possible benefit of mergers could come from other superior management abilities at the acquiring bank. For example, if the acquirer has superior underwriting capabilities, it may be able to decrease the ratio of non-performing loans at the acquired institution and increase profits.

Focarelli, Panetta and Salleo (2002), in a study of mergers and acquisitions in Italy, find that the most common goal in acquisitions (purchase of a bank without integration of the acquired bank into the network of the acquiring bank) is to increase loan quality. Improved loan underwriting procedures are introduced, but other cost factors are not changed. In both cases, the main source of cost-cutting seen in the U.S., decreases in staffing levels, is absent, because Italian law, like law in most of the EU, makes staff reduction very difficult.

5) Another possibility is that while economies of scale may be modest, economies of scope may be significant. In other words, it may be more economical to combine commercial banking with investment banking and perhaps life insurance than to pursue commercial banking only. This might be the case because of synergies between the knowledge bases of commercial and investment banks about particular companies (Danthine et al 1999). Cybo-Ottone and Murgia (2000) support this with event-study findings showing that mergers between banks and insurance companies in Europe on average generate large positive abnormal excess stock market returns.

It should be noted that the existence of economies of scope is not obvious. There just as well may be diseconomies from trying to manage complex organizations with disparate types of business. Managers may be unable to effectively control both insurance and banking activities, and instead of synergies, increased costs may result.

Thus, the question of economies of scope is mainly an empirical one. If economies of scope are considerable, we should see large, conglomerate banks dominating the marketplace. While it does seem that the largest banks are already financial conglomerates or are trying to become conglomerates in this sense, the jury is still out on whether they really have clear advantages. Milbourn et al (1999) actually suggest that banks may be expanding their scope precisely because they are not sure whether this is a good strategy, but want to have the option to diversify into other activities if this proves to be desirable.

6) Another possible answer that partially includes the previous one is that larger banks find it easier to take advantage of opportunities for diversification. These opportunities may be geographical (expansion to multiple regions or countries) or in terms of business sector (diversified customer types) or in terms of product (commercial banking vs investment banking etc.) Demsetz and Strahan (1997) find strong evidence that larger Bank Holding Companies in the U.S. are better diversified than smaller ones. Importantly, however, they do not find that this leads to decreased portfolio risk. Instead, larger BHC's take on a larger proportion of risky assets than smaller ones, ending up with roughly the same level of asset risk as their smaller competitors. For example, larger BHC's hold proportionally less government paper and more loans than smaller BHC's. The point of this, of course, is that larger BHC's earn more on these risky assets, and thus end up with higher earnings and the same risk as compared to smaller BHC's.

Hughes et al (1999) reinforce Demsetz and Strahan's findings with simulations of possible bank strategies. They show that an expansion strategy that diversifies banks' macroeconomic risk by entering markets with low levels of macroeconomic correlation is profitable. This suggests that a strategy of expansion across properly selected U.S. states, or, by analogy, European countries whose business cycles are not highly correlated, would be profitable.

Berger (2000) suggests that this may be a key advantage of mergers. He finds that the benefits from mergers are not mainly from improved cost efficiency but

from improved revenue efficiency, and he argues that improved diversification is the cause of improved revenue efficiency.

In short, while there is much more research needed to fully understand the dynamics of bank mergers, some elements have become clear. Mergers do not seem to be driven by cost efficiencies, but rather by revenue efficiencies created by economies of scope and diversification opportunities. This suggests that large, multinational banking conglomerates may well be stable and powerful presences in the future of banking. At the same time, it is clear that many mergers fail to create value. Managerial motives, both "good" (taking over other banks run by inferior managers and improving performance) and "bad" (empire building) also are present. With competition increasing and capital markets increasingly open, it seems logical to expect continued mergers in Europe as a whole and in Croatia in particular. However, the costs and benefits of these mergers will have to be assessed carefully, and regulators will have to scrutinize mergers for possible anti-competitive effects with an open mind, without prejudging whether the merger is harmful or beneficial.

3 Empirical Evidence on Competition in the Croatian Banking Market

3.1 Concentration and Indicators of Competition in Croatia

As section 2 elaborates, both economic theory and the experience of various countries around the world suggest that the connection between competition and concentration is not straightforward. Croatia's experience also reflects this. Ca-

**Figure 1** Bank Loan Rates 1997–2004
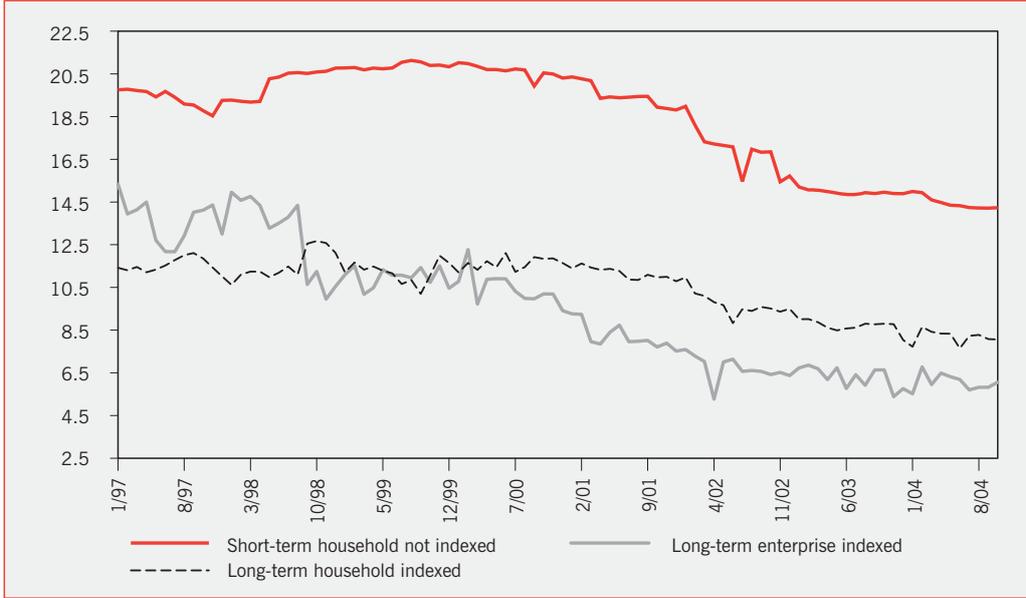
sual empiricism tells us that interest rates have fallen substantially in recent years, and that somehow the market is more competitive than before.

This contention is illustrated by the Figure 1 and Figure 2. The first shows three of the most important interest rates, short-term loans to households without the indexation clause, long-term loans to enterprises with the indexation clause, and long-term loans to households with the indexation clause. The remaining category, short-term loans to enterprises without the indexation clause, is omitted because of a methodological break at the beginning of 2002 that obscures the trend somewhat.

Lending rates show a very strong downward trend. Interest rates on long-term loans to enterprises had fallen by more than 60% by October 2004, and the other two interest rates had each fallen about 30%.

Also, as the Figure 2 shows, the margin between lending and deposit rates fell by almost 70%. While this margin had been far above that in EU countries in 1997, in late 2004 the margin in Croatia was roughly comparable to that in new member states of the EU, and only mildly above that seen in older EU member states.

Figure 2 Difference between Interest Rates on Indexed Loans and Foreign Exchange Deposits
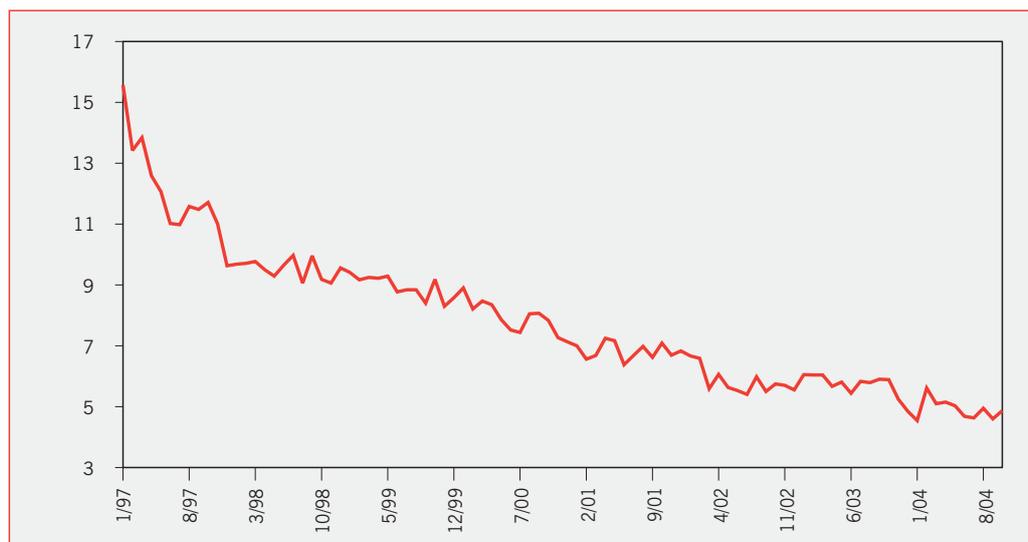
But we must be careful here. There are many determinants of the level of interest rates. Monetary policy plays a central role here, as does fiscal policy (the extent of government domestic borrowing). Thus, the level of interest rates by itself is not an adequate indicator of the degree of competition. The evidence shown above – specially the evidence on margins – strongly suggests increasing competition. But it does not prove the case conclusively.

Competition among banks should, however, decrease the differences between interest rates among banks. If we think of a perfectly competitive banking system, all banks would charge exactly the same interest rate for a particular product of-

fered to a client of given characteristics. So, if we can find a homogeneous enough product offered to relatively a homogeneous group of clients, we can get a rough idea of the degree of competition in the banking system by looking at the variation of interest rates at various banks.

A category that meets these criteria is short-term lending in kuna to households. The product is rather homogeneous, consisting overwhelmingly of overdrafts and lines of credit based on current accounts. The clients are not so homogeneous in reality, but banks treat them as though they were: interest rates on these kinds of loans do not vary according to the creditworthiness of clients.

For these reasons, an indicator of the variation in interest rates on short-term kuna loans to households should be a good indicator of competition. I use the coefficient of variation (standard deviation divided by the mean), since this commonly-used statistic is not sensitive to the level of interest rates. Thus, monetary policy shifts or changes in government borrowing should not have an effect on the coefficient of variation (CV).

Another product that is rather homogeneous is foreign exchange deposits by households. While there are some differences in maturity (banks usually offer a set of maturity choices from 1 month up to 3 years) and by size of deposit, the differences in interest rates resulting from these factors is likely to be much smaller than differences within categories such as long-term loans (whether to enterprises or households.)

Also, it is clear to any observer of the Croatian banking system that the top banks offer relatively similar products, while many of the smaller banks cater only to specific types of customer or only operate in specific geographical areas. Thus, in describing the degree of competition in the largest markets that have the greatest weight in the operations of the banking system as a whole, it may be useful to concentrate on the largest banks. This is why we plot the coefficient of variation

Figure 3 Coefficient of Variations of Interest Rates

on short-term loans to households and on foreign exchange deposits of house-holds at the 10 largest banks in Croatia in the Figure 3.

The patterns are rather interesting. As expected, there is some tendency for decreased dispersion. However, it is not clear whether this is purely the result of increasing competition. Regarding short-term loans to households, we see a big jump in the third quarter of 1999, followed by a rather steady decline. By the end of the period, dispersion reaches its lowest point. Examining the individual bank data, it turns out that the big jump was the result of a fast-growing bank offering unusually low interest rates and thus increasing dispersion. Over time, other banks have lowered their rates and the low-rate bank somewhat raised its rates. Nonetheless, at the last observation in the second quarter of 2004, rates ranged between 11.4% and 16.4%.

This detailed analysis suggests that competition did bring rates down, but not in a simple way. The actions of a bank that wanted to increase its market share by offering lower rates did affect the market, but the market average only decreased gradually over time.

If we look at the figure on foreign exchange deposits, we see a somewhat smoother development. However, a little examination of the data shows that a good deal of the decrease in the CV in 1998 was due to the exit of those banks that offered exceptionally high deposit interest rates.[1] Also, as depositors started to recognize that such high rates could be linked to bank failure, other banks started to lower their rates to avoid "guilt by association". Even this episode could be at-

**Figure 4** Coefficient of Variation on Short-Term Loans to Households vs HHI Index for Loans

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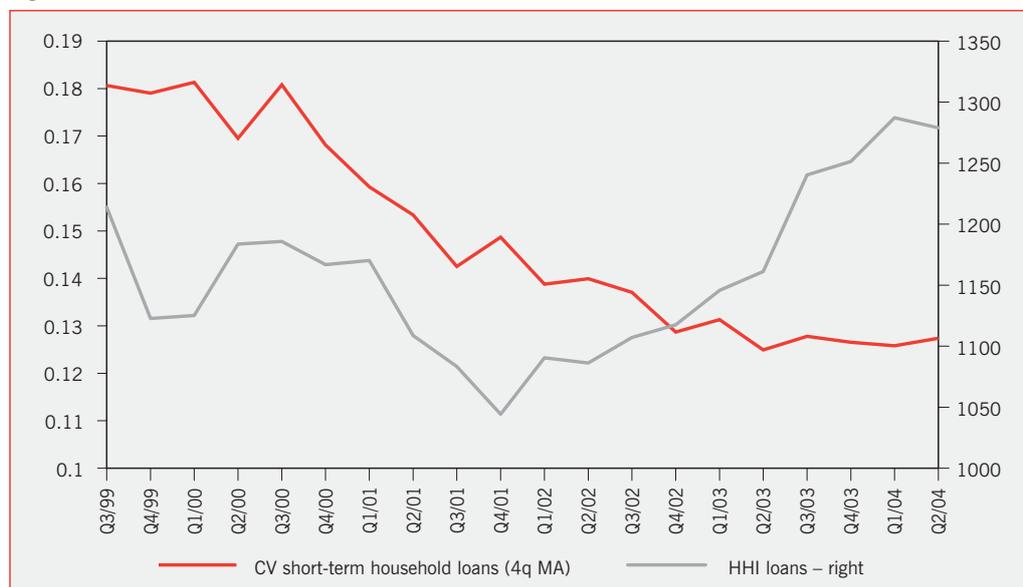
1 We excluded banks from the calculation at the moment that their accounts were blocked rather than at the moment of the beginning of bankruptcy procedures. We decided on this approach because the actions of banks under blockade were very much limited and did not represent "normal" conduct of business.

tributed to increased competition in a way. And the continued decrease in dispersion thereafter also seems to be caused by gradually growing competition.

A logical next step would be to compare these indicators of competition based on interest rate divergence with more traditional indicators. To do this, we calculate the CV of interest rates on short-term loans to households at all banks, so that the sample is the same for both types of indicators. The Figure 4 plot the evolution of this CV versus the two most common indicators of concentration, the HHI and the CR5.

Not too surprisingly, the two approaches yield conflicting results (See Figure 4). While the CV falls rather continuously from late 2000 through mid-2003 and then stabilizes, the HHI takes off in late 2001. The two indices only move together for a short period (roughly from mid 2000 to end 2001).

Figure 5 CV on Short-Term Household Loans vs CR5 Ratio of Loans
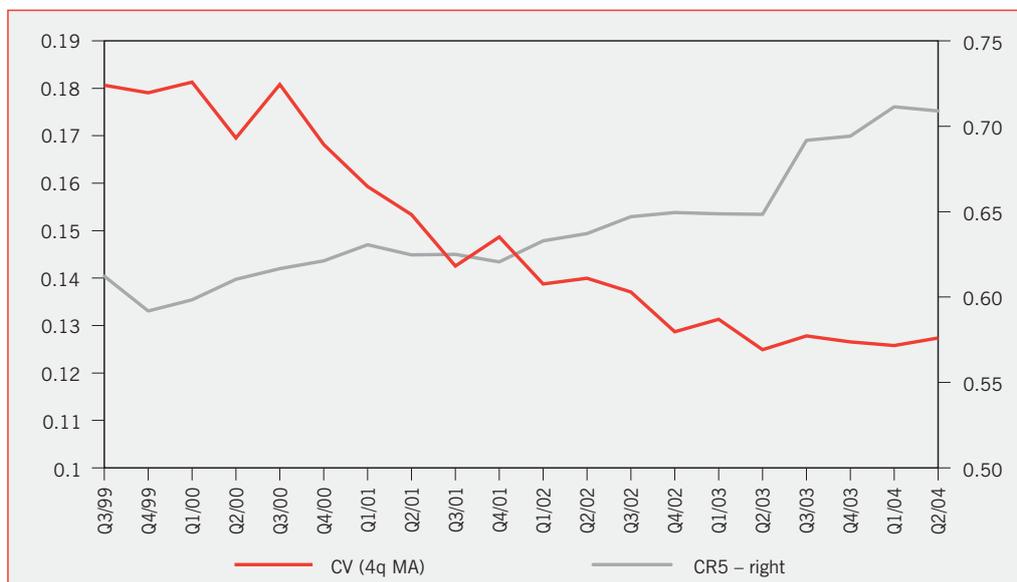
If anything, the CR5 gives even a more divergent picture (Figure 5). It increases fairly steadily from end-1999, in complete contrast to the CV. We can draw either of two conclusions: either the CV is not a very good indicator of competition, or the concentration indicators are not correlated with competition.

We can also compare the CV on interest rates on foreign exchange time deposits to the traditional concentration indicator. Figure 6 presents the comparison.

The Figure 6 again shows the complete lack of correlation between interest rate dispersion and concentration. In this case, we see the CV falling fairly steadily from 1997 to late 2000, in line with the hypothesis of increasing competition. But then we see a very substantial increase in dispersion.

The HHI actually seems to be highly negatively correlated with the CV. The HHI rises from 1997 through early 2000, and then falls quite a bit through the end of 2001, and then more or less stagnates.

Figure 6 CV for Foreign Exchange Time Deposits vs HHI for Deposits
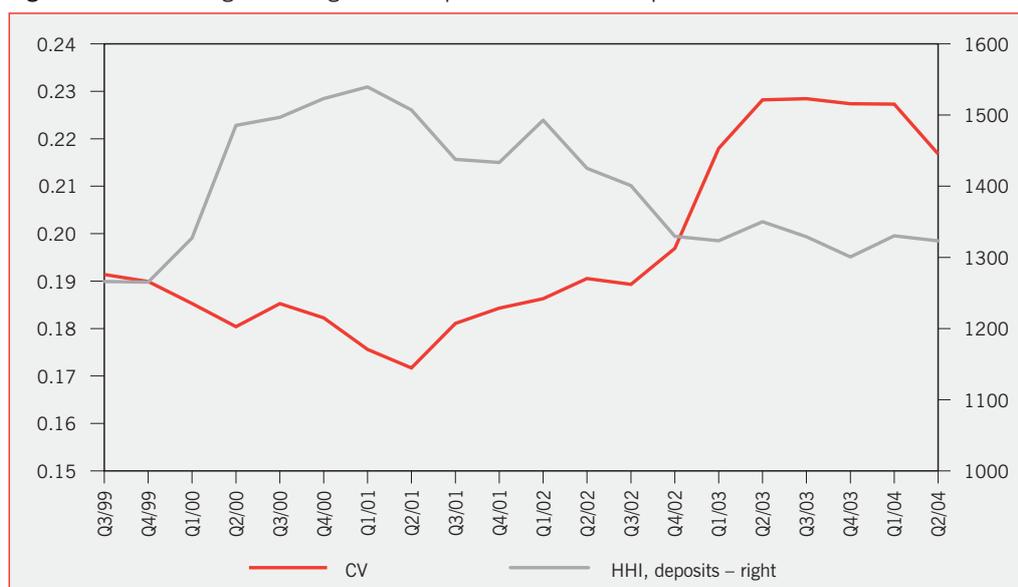
So once again, it does not seem that the HHI can really explain competition. But it is quite interesting and a little puzzling that interest rate dispersion, as measured by CVs, rises so sharply, especially after late 2001. Our previous analysis suggests that the increase in the overall CV is due to divergences between interest rates at the largest 10 banks and at other, smaller banks. When we take into account heterogeneity of products, the heterogeneity of customers, and the heterogeneity of regions (i.e. the possibility that regional markets are somewhat isolated from the rest of the country and face particular supply-demand conditions), we realize that the CV may not reflect competitive conditions adequately. More sophisticated techniques will be needed to measure the level of competition.

At the same time, we can also dismiss the idea that HHIs or CR5 indices tell us the whole story. As we saw in section 2, the nature of the strategic interaction among banks is not completely determined by concentration levels, but is also a function of customer characteristics, past history and tastes, and the moves of the players themselves. Since it is extremely difficult to clearly model and measure these factors, the most fruitful way to study competition is to find measures of outcomes. In the sections to come, we will look at the following kinds of evidence: survey evidence obtained from asking bankers about the level of competition; regression analysis of interest rates using aggregate data; two more formal competition tests, the Panzar-Rosse h-test, and the Lerner Index; and the Jeon-Miller decomposition of efficiency change.

3.2 Survey Data

The Research Department of the Croatian National Bank has undertaken four waves of interviews with commercial banks, in 1997, 2000, 2002, and 2004. These interviews have been used to gain additional information about the banks

and their business, and to facilitate dialogue between the central bank and the commercial banks. All of the interviews have included questions about competition.

In the 1997 interviews (Kraft, Curavić, Faulend and Tepuš 1998), banks were asked about the degree of price competition they experienced. The Table 1 shows that answers were split fairly evenly among the three main choices.

Table 1 Does Your Bank Follow Interest Rate Changes on the Market, or Are You Able to Set Interest Rates at Your Discretion?

Answer	Frequency	Share of sample banks	Share of sample assets
Are mainly forced to follow the market	20	36%	37%
Have some room to maneuver	13	24%	13%
Do not need to react to the market	15	27%	40%

These answers suggested that quite a few banks actually were insulated from price competition. Among these were market-leading banks, whose interest rates actually provided signals or pressure for other banks; banks with dominant market positions in local markets; and banks operating in market niches. The relatively large number of banks giving such answers suggested that price competition was quite limited in 1997.

In addition, banks were asked questions about their marketing strategies. The answers to these questions suggested that non-price competition was quite important, with banks putting emphasis on speed of service, flexibility in helping clients, and supply of new products as the key means to gaining new clients.

In the 2000 survey (Galac and Kraft 2000), the question of the impact of foreign banks on the level of competition was asked. 67.5% of the responding banks, with 59.2% of the survey assets, answered that foreign banks had not affected loan rates at all. 27.5% of the respondents, with 39.8% of survey assets, responded that foreign banks had indeed forced loan rates down. It should be noted that these answers refer to the period in which foreign banks were a minor presence on the Croatian banking scene, holding under 10% of total banking assets. In many cases, foreign banks seemed to accommodate to the existing interest rate structure, although foreign banks did offer statistically-significantly lower deposit interest rates.

In the 2002 survey (Galac 2003), bankers argued that decreasing interest rates and greater availability of long-term loans for both households and enterprises were the result of increased competition. They explicitly disagreed with the idea that lower interest rates might be the result of greater legal security of creditors or of decreased credit risk. In addition, bankers surveyed regarded the role of foreign banks in creating market competition as much larger from 2002 on than it had been in the past (Kraft 2002). Bankers rated the impact of foreign banks on

market competition in Croatia at 2.44 (on a scale of 1 to 5, with 1 the lowest and 5 the highest) before 2000, 3.75 in 2000-2001, and 4.88 from 2002 on.

According to survey results from 2004 (Dukić and Galac 2005), the high level of competition among banks that began in 2000 continued. The recent development of non-bank financial intermediaries has added another layer of competition. Several bankers mentioned that competition from non-banks is stronger on the liability side. Above all, investment funds have taken a share of enterprise deposits and raised the price for such deposits. On the asset side, leasing companies also provide competition. This was felt especially strongly during 2003, when leasing companies took up a good deal of credit to households, in part due to the central bank's credit restrictions, which applied only to banks.

When it comes to competition for market share, banks' fiercest rivals are other banks. Bankers agree almost unanimously that competition is present in all segments of their business, but that the sharpest competition occurs in the retail segment. In addition to the household segment, several banks mentioned the small and medium enterprise segment, which has recently become a target group not only of small but also of the largest banks, and the large enterprise segment, where the clients themselves are quite able to choose among service providers.

While small and medium banks in general could not identify any segments of the banking businesses with less competition, the large banks could. For them, competition is lower for products and services requiring substantial financial and technological investment, such as structured products for enterprise finance and long-term project finance.

More than half of the banks (with 98% of total assets) expect that competition will increase even further in the next two years. The effects of competition will be seen in further decreases in bank's loan interest rates, decreases in interest margins, greater efficiency, introduction of new products and services and improvements in quality. It is interesting that banks, despite decreasing interest margins, assessed the effects of competition on bank profitability as generally positive.

Bankers expressed the opinion that the consolidation process is not over. They expect further bank mergers. It is interesting that 18 bankers (54%) feel that the number of banks in Croatia is still more than the optimal. If we add to that three bankers who feel that the number is much more than the optimal, we see that 21 banks, with 96% of banking system assets, believe that there should be further decreases in the number of banks.

Market competition has resulted in a substantial increase in the range of products and services offered by banks in the last two years. Along with new services such as providing payment services for clients, large numbers of banks have introduced internet banking, as well as investment banking and securities custodial services.

In summary, the survey data suggests growing competition, above all growing price competition over time. The large-scale arrival of foreign banks after 2000 is perceived by bankers to have greatly increased the level of competition.

Evan Kraft

3.3 Determinants of Interest Rates

Survey data, while providing useful impressions of what is going on in the market, cannot be the main source of information about competition. Obviously, bankers have biases that arise from their position in markets. Also, while bankers observe a great deal in their daily business, many economic processes are longer-term and can only be fully seen through analysis of quantitative data.

As a starting point for quantitative analysis, it is useful to look at the main determinants of interest rates. Although this approach also has its limitations, it will provide useful background for the direct tests of competition below. The limitation of this approach is the following: most interest rates in Croatia show a fairly steady downward trend. To apply econometric techniques correctly, it is necessary to first-difference the series. However, it is likely that the effects of competition are expressed in the trend itself. For it is probable that increased competition is the main factor pushing interest rates lower over the last decade in Croatia. Actions such as bank rehabilitation and the exit of bad banks that also lead to lower interest rates reflect, on the one hand, intervention to restore a competitor to health and thus to increase competition, and the removal of actors whose behavior distorted competition. These micro factors are thus to an extent products of competition, and also produce competition.

With this in mind, we now turn to regression analysis of lending interest rates. We have chosen the most prevalent rate, lending rates on kuna loans with indexation. We consider that lending rates should depend on past lending rates, deposit interest rates, monetary conditions, reserve requirements, and measures of concentration and competition. As was mentioned above, we use the first difference of lending rates and the first differences of the explanatory variables to avoid spurious correlations due to non-stationarity.

Table 2 Descriptive Statistics for Regression Variables

	Mean	Standard deviation	Minimum	Maximum
Interest rate on indexed loans, %	11.26	3.01	7.07	18.11
Interest rate on foreign exchange deposits, %	4.49	1.43	2.61	7.49
M1, million HRK	19,442	7,894	10,955	33,889
Actual required reserves held, %	0.17	0.04	0.26	0.09
HHI, deposits	1,303	158	1,034	1,539
CR5, deposits, %	65.23	4.7	56.61	70.84

Table 3 Determinants of dlog (interest rates on indexed loans)
Time period: Q3 1997 – Q2 2004

	Model 1	Model 2
Constant	−0.044[b]	−0.043[b]
	(4.350)	(4.593)
dlog(deposit interest rates)	0.267[a]	0.277[a]
	(2.411)	(2.539)
dlog (M1)	−0.016	−0.021
	(0.395)	(0.556)
dlog (reserve requirement)	0.121	0.101
	(1.349)	(1.270)
dlog (standard deviation of loan rate)	−0.025	
	(0.442)	
dlog(HHI, deposits)	0.053	
	(0.305)	
dlog(CR5 ratio, deposits)		0.215
		(0.600)
dlog(lagged loan interest rate)	−0.613[b]	−0.611[b]
	(4.410)	(4.548)
Adjusted R-squared	0.427	0.454
Observations	28	28

[a] significant at 5%;   [b] significant at 1%
Note: dlog means first difference of logarithm (log x_t − log x_{t-1})

The results suggest that the only significant determinants of changes in lending interest rates are changes in deposit interest rates and lagged changes of lending interest rates. Monetary aggregates and both conventional concentration measures are insignificant. The coefficient on reserve requirements is insignificant at conventional levels, but is large enough to make one suspect that this factor might have an influence.

It is also interesting to note that the constant term in the regression is quite significant. In other words, the rate of change of lending interest rates is steady, varying around a constant rate. This probably represents the steady effect of competition over time; competition gradually and steadily pushed lending interest rates down in the period studied.

Unfortunately, similar regressions for deposit interest rates were completely uninformative, with none of the explanatory variables showing significance. Thus, simple regression analysis has not helped to improve our understanding very much. We therefore now turn to more formal tests of competition.

3.4 The Panzar-Rosse h-test

The Panzar-Rosse h-test (Panzar and Rosse 1987) is a theoretically-grounded and widely used method to measure the degree of competition in actual markets. This method takes advantage of the fact that the response to input price changes will vary according to the degree and nature of competition. In a perfectly com-

petitive market, price equals marginal cost, so that any change in marginal cost will be exactly reflected in price changes. However, in a situation of monopolistic competition, prices are already above marginal cost. Thus, adjustment of output prices to input prices will only be partial, depending on the degree of competition. In the extreme case of a monopoly, output prices will not change when input prices change, because output prices are optimized to maximize revenues and continue to be set above marginal costs.

Allen and Gale (2001) argue that banking competition generally can be characterized as monopolistic competition. That is, banks do not offer completely homogeneous products. Instead, banks can be differentiated by characteristics such as location, extent of branch network, and products offered. For the theory of competition, the key issue is not whether the differences among products are real, but whether consumers perceive them to be real. So long as consumers perceive differences among producers and are willing to pay a higher price for what they perceive as better or more useful products and services, perfect competition is impossible, and monopolistic competition prevails.

Within monopolistic competition, however, the degree of competition can vary from very high, close to perfect competition, to minimal, close to monopoly. Thus, while Allen and Gale's point suggests that we will never find fully perfect competition or monopoly in banking markets, we can still expect the degree of competition to vary.

Indeed, several papers have recently attempted to use the Panzer-Rosse test to compare the degree of competition across countries and across time. De Bandt and Davis (2000) and Bikker and Haaf (2002) examine the degree of competition in EU-member states banking markets. Characteristically for the Panzar-Rosse test, these two studies reach somewhat diverging conclusions about the degree of competition, with De Bandt and Davis finding European markets less than the U.S. market, and Bikker and Haaf finding European banking markets actually more competitive than the U.S. market.

Pawlowska (2005) applies the Panzar-Rosse test to Poland, and finds evidence of mild increases in competition despite increasing concentration. She also notes that the level of competition and the market share of foreign banks is correlated, suggesting that foreign bank entry raises competition.

Claessens and Laeven (2003) study a large panel of countries, and relate their findings on competition levels to traditional concentration ratios. Most importantly, they find that the degree of competition, as measured by the Panzar-Rosse test, cannot be explained by traditional concentration indices. That is, when they use CR type indicators as explanatory variables in cross-country regressions explaining competition levels, these variables are consistently insignificant, or occasionally incorrectly signed (greater concentration is associated with more competition). The variables that seem to matter for competition in Claessens and Laeven's work include the degree of foreign bank participation, the severity of entry restrictions (more restrictions on entry lead to lower competition), and restrictions on bank activities (less restrictions, more competition).

The test is carried out by estimating the following equation:

$$\ln(p_{it}) = a + b1_{it}\ln(W1_{it}) + b2_{it}\ln(W2_{it}) + b3_{it}\ln(W3_{it}) + c1_{it}\ln(Y1) +$$
$$+ c2_{it}\ln(Y2) + c3_{it}\ln(Y3) + e_{it}$$

where p is a ratio of income to assets (usually gross interest revenues to total assets), the W's are factor costs (labor, funds and physical capital), and the Y's are exogenous variables affecting income. The Panzar-Rosse h-test is then formed by calculated the sum of the bj coefficients, $b1_{it} + b2_{it} + b3_{it} = h$. If h=1, the market is perfectly competitive. If 0<h<1, the market is characterized by monopolistic competition. And if h<0, the market is a monopoly.

However, before testing the model, it is necessary to test to see whether the banking system under analysis was in long-term equilibrium over the period studied. The reason for this is that the characterizations of the market as perfectly competitive, monopolistically competitive or monopoly are based on the assumption that the system is observed in equilibrium.

Testing for long-term equilibrium involves an additional test, in which the dependent variable is return on assets rather than income to assets. In long-term equilibrium, the return on assets should not vary if factor prices vary. That is, in the equation

$$\ln(roa_{it}) = a + f1_{it}\ln(W1_{it}) + f2_{it}\ln(W2_{it}) + f3_{it}\ln(W3_{it}) + g1_{it}\ln(Y1) +$$
$$+ g2_{it}\ln(Y2) + g3_{it}\ln(Y3) + e_{it}$$

the sum of the coefficients $f1_{it} + f2_{it} + f3_{it}$ should equal zero.

We estimated the model for Croatia using panel data on all banks operating in the years 1994-2004. The input costs were: labor costs, interest costs, and administrative and operational costs. The exogenous variables, following Claessens and Laeven (2003), were total bank assets, loans to assets, and the capital asset ratios. The left-hand side variable was interest income to assets. All data were from the Croatian National Bank's bank database.

The results were comparable to Claessens and Laeven's. Since they used data from BankScope, which only covers some of the banks operating in Croatia, our data set covered more banks. Also, there may be slight differences in data definitions. However, like Claessens and Laeven, we find monopolistic competition for the whole period, and cannot reject the hypothesis that the banking system was in long-term equilibrium in the period. Following the literature, we used both Ordinary Least Squares and the Fixed Effects estimator. As is evident in De Bandt and Davis (2000), choice of estimator can have a substantial effect on the estimated value of the h-statistic.

Our estimate for the h-statistic using OLS is 0.56, and using Fixed Effects we estimate h to be 0.60. This is entirely in line with Claessen and Laeven's estimate for Croatia of 0.52 to 0.59 (for 1994–2001 only, however). The Table 4 compares these findings with Claessen and Laeven's findings for selected European countries:

Table 4 Panzar-Rosse h-statistic Estimates for Croatia and for Selected European Countries, 1994–2001

	OLS	Fixed effects
Croatia (HNB[a])	0.56	0.60
Croatia (C&L)	0.52	0.58
Czech Republic	0.56	0.80
Denmark	0.41	0.53
France	0.59	0.63
Germany	0.39	0.60
Greece	0.89	0.85
Hungary	0.83	0.48
Italy	0.48	0.58
Latvia	0.58	0.42
Poland	0.77	0.79
United Kingdom	0.60	0.73

[a] 1994-2004

Sources: Claessens and Laeven (2003) and author's calculations.

It is worthwhile to once again note that, for some countries, there are substantial differences in the estimate depending on the methodology used. However, whichever method we look at, we see that competition in Croatia is at a similar level to most of the other European countries studied. Only Poland and Greece seem to have substantially more competitive banking systems than Croatia using both methods, while Hungary, the UK and the Czech Republic have high levels of competition using only one of the methods.

Claessens and Laeven used the h-test to compare competition across countries, and to look for the determinants of competition. We, by contrast, test for variations in competition across time. To do this, we estimated the basic model with slope dummies. We distinguished the period 1994–1999 from the period 2000–2004. In the Fixed Effects model, the equilibrium conditions are just barely met for the 2000–2004 period; we can only reject the hypothesis that the system is out of equilibrium at 11% confidence. In the OLS model, the equilibrium condition is met comfortably. Interestingly, there is very little difference between the estimates of h for the two periods: 0.54 for 1994–1999, and 0.55 for 2000–2004. This difference is not statistically significant according a Wald test. However, in the Fixed Effects estimate, the h-statistic rises from 0.58 for 1994–1999 to some 0.75 in 2000–2004. This difference is significant, and implies a substantial increase in competition in the 2000–2004 period. However, one should be cautious about drawing strong conclusions here, both because the OLS estimates do not confirm this, and because of the weak equilibrium test results for 2000–2004.

3.5 Measuring Competition through Estimating Mark-ups: the Lerner Index

The Panzar-Rosse test is widely accepted by economists, because it provides a clear indication of the degree of competition, and can be derived from basic microeconomic theory. Unfortunately, the model's assumption of long-term equilibrium, as we have seen, makes it difficult to use if one wants to compare competition during relative short time periods. As we have seen, in the case of Croatia, the Panzar-Rosse test does not give us very clear evidence about whether the intensity of competition has changed since the mid 1990's.

Fortunately, there are alternative approaches. Angelini and Cetorelli (2003) show that a very common behavioral model can be used to measure the degree of competition in the industry. The model supposes that individual banks set prices to maximize profits, with prices including two components: marginal cost and a mark-up based on market power. The price equation is then:

$$p_j = C'_j (q_j, w_j) + \lambda$$

C' represents the derivative of the cost function C, which is to say it represents marginal cost. Cost C is a function of the quantity of output, q, and input prices, represented by the vector w. λ turns out to be an indicator of the industry's overall degree of market power. When divided by the average output price of the industry, this indicator allows us to compute the Lerner Index, $L=\lambda/p$, which measures the relative mark-up of price over marginal cost.

Given a large enough number of firms in the industry, it is possible to estimate the Lerner Index year-by-year. Angelini and Cetorelli do this by also estimating a translog cost function:

$$\ln(C_j) = c_0 + s_0 \ln q_j + (s_1/2)*(\ln q_j)^2 + \Sigma c_i w_{ij} + \ln q_j \Sigma s_{i+1} \ln w_{ij} + \\ + c_4 \ln w_{1j} \ln w_{3j} + c_5 \ln w_{1j} \ln w_{2j} + c_6 \ln w_{2j} \ln w_{3j} + \Sigma c_{i+6} \ln(w_i)^2$$

Using this translog function, they calculate marginal cost C' and substitute it into the price function above, giving the following estimatable price equation:

$$p_j = C_j/q_j (s_o + s_1 \ln q_j + \Sigma s_{i+1} \ln wij) + \lambda$$

This method provides more precise estimates than simply running regressions for the price function alone. The three-stage least squares (3SLS) method is used to provide the most consistent estimates possible.

A comment should be made on this methodology. It considers the bank's total assets to be its output. That is, the bank's production of goods and services is equated with its total assets. This assumption may be somewhat unjustified for the mid-1990's in Croatia, when some banks held substantial amounts of big bonds and bad loans from the past. However, as time goes on, this objection loses force. We have not attempted to try to adjust banks' assets for holding of such items, be-

cause of the danger that the choice of which assets to remove from consideration would be arbitrary.

The Lerner Index was estimated on annual bank data for the period 1995–2004. The Figure 7 shows the main results.

Figure 7 Lerner Index and Marginal Costs, All Banks
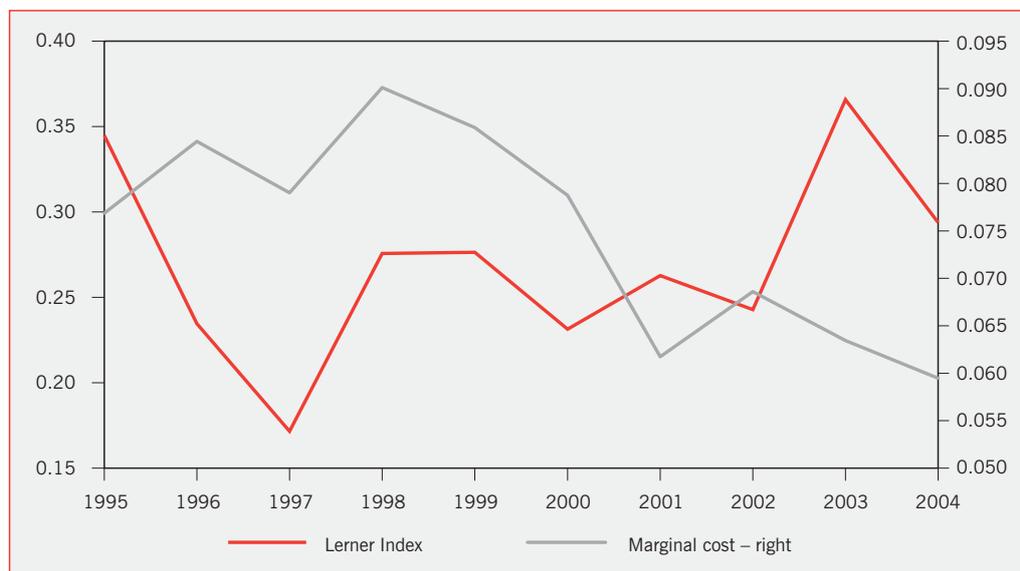
We see that the mark-up, as measured by the Lerner Index, fell sharply from 1995 to 1997, only to bounce back in 1998–1999. The index fell again a bit in 2000, and after smaller fluctuations in 2001 and 2002, rose sharply in 2003, and then fell part of the way back in 2004. On the face of it, we would have to conclude that competition was the strongest in 1997, decreased during the banking crisis of 1998–1999, and actually increased mildly as concentration increased and foreign banks achieved dominant market shares in 2000–2002. The large increase in the Lerner Index in 2003 would seem to be the result of the measures of the CNB, which restricted credit growth and encouraged banks to concentrate on the most profitable products. Consistent with this interpretation, the Lerner Index decreased once these measures were repealed in 2004.

The marginal cost estimates also tell an interesting story. Here we see strong decreases in marginal cost starting in 1999–2001, a rise in 2002, and smaller decreases in 2003–2004. By this measure, the banking system became considerably more efficient after 1999.

However, one must be careful about interpreting the Lerner Indices. Two elements may be involved here. First, it appears that bank prices as defined in this analysis are not independent of size. The smallest banks actually charge higher prices, so that there is a significant negative relationship between price and asset size. However, it appears that this relationship only applies below a certain threshold. That is, when we run the following regression

$$p = a + b \log(q) + e$$

where p is price and q is total bank assets, the coefficient b is negative and significant when all banks are considered. This is true for all years from 1995 to 2004. However, if we start to exclude the smallest banks, the coefficient b eventually becomes insignificant, suggesting that the price–size relationship only holds for the smallest banks. In fact, in all years except 2000, once we exclude banks below HRK 400 million or HRK 500 million, the relationship ceases to hold.

This suggests that we might try running the same tests for banks with assets above HRK 500 million only. The Figure 8 shows the Lerner Index for these larger banks reaches a minimum in 2000, but rises from then until 2003. Only in 2004 does the Lerner Index start to come down again for large banks.

At the same time, marginal costs at large banks decline more steeply than at all banks. By 2004, marginal costs stood at just below 5.5%, far below the 8.5% level of 1999.

Figure 8 Lerner Index and Marginal Costs, Banks with Assets more than HRK 500 million
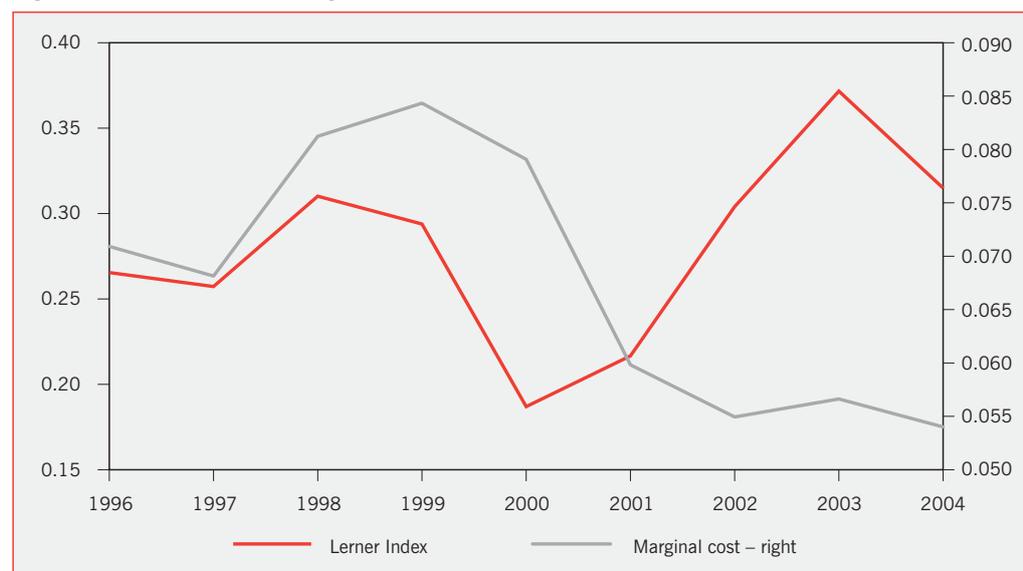
Another concern with this analysis is that the behavior of failed banks, many of whom offered very high deposit interest rates and thus may have had somewhat artificially low mark-ups, may be affecting the analysis. The Figure 9 shows what happens if we only include non-failed banks in the analysis (this means that we include all the smaller banks that did not fail).

For the non-failed banks, the Lerner Index estimates also are at a minimum in 2000, stay low in 2001 and 2002, shoot up in 2003, and fall back to just below the levels of 1998–1999 in 2004. Thus, in this estimate, price competition increases in 2000–2002, but then decreases in 2003–2004, ending up approximately where it was in the late 1990's.

Figure 9 Lerner Index and Mark-ups, Non-failing Banks
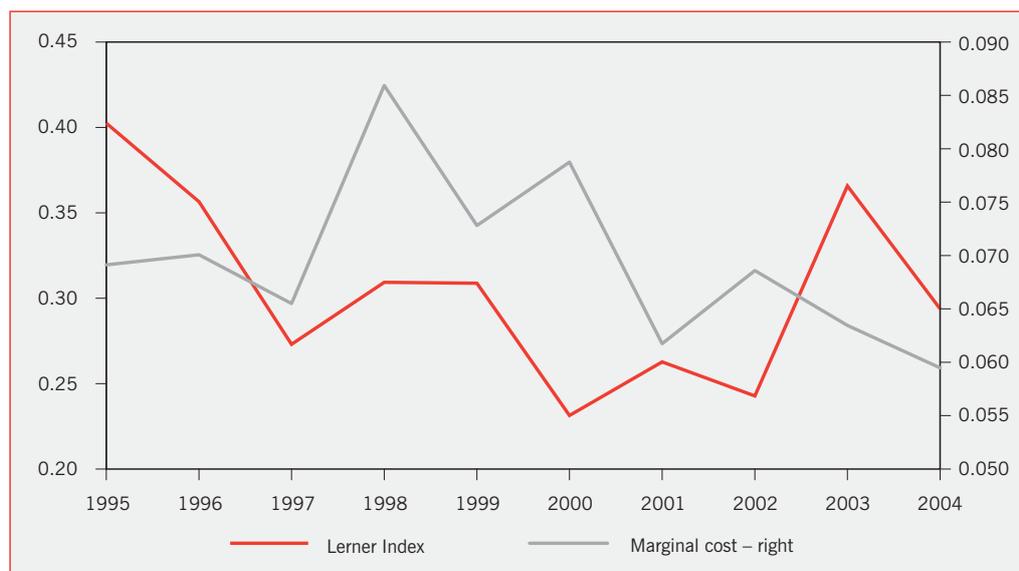
For the non-failed banks, the decrease in marginal cost is somewhat smaller than for the large banks. Still, over the whole period observed, marginal cost decreases only from 0.069 in 1995 to 0.059 in 2004, a 14.5% decrease.

Before drawing conclusions, we should note that Angelini and Cetorelli document that the Lerner Index is influenced by various macroeconomic factors. The key factors are real GDP growth and short-term interest rates (positively correlated with the Lerner Index) and inflation (negatively correlated). Also, greater bank holdings of securities (less risky assets) are correlated with lower Lerner Indices.

We do not have enough observations to analyze this rigorously for Croatia. However, if we compare 1998 and 1999 to 1997, we can note that GDP growth was lower and inflation higher in the later years. These factors should have lowered the Lerner Index, but in our estimates the index rose. This suggests that the increase in the Lerner Index in 1998 and 1999 was not due to macroeconomic factors, but most likely was indeed due to decreased competition during the banking crisis.

It is difficult to be sure about 2000 in this context, because we have increased GDP growth, which should increase the Lerner Index, but also increased inflation, which should decrease the Lerner Index. If these two effects roughly cancel out, then we may again be justified in looking at the fall in the Lerner Index in 2000 as an increase in competition.

Finally, in 2001 and 2002 we have lower inflation and more rapid GDP growth, both of which should increase the Lerner Index. Thus, the small increases we see in the Lerner Index in 2001 and 2002 may be due to macroeconomic factors, rather than decreased competition. Finally, in 2003 and 2004, growth was a little slower than in 2002, and inflation very slightly higher; it seems doubtful that these macroeconomic factors can explain much of the large decrease in price

competition in 2003, or the smaller but still substantial increase in 2004. All of this analysis, however, is rendered somewhat speculative by our inability to quantify the macroeconomic effects.

A final comment should be made about the relationship between the Lerner Index estimates and concentration ratios. Figure 10 shows the Lerner Index for all banks and the Herfindahl-Hirschman Index. After moving in parallel in 1996 and 1997, the indices diverge in 1998, with the Lerner Index rising while the HHI stayed flat. That is, the increase in the Lerner Index in 1998 cannot be attributed to increasing concentration.

At the same time, when the HHI rises in 1999 and 2000, the Lerner Index stays constant and then falls. Again, there seems to be no connection between increased concentration and movements in the mark-up. Finally, the large increase in the Lerner Index in 2003 actually comes as the HHI only grows very slightly, and in fact follows on two years in which the HHI actually falls. Thus, the overall conclusion must be that the connection between the two indices is weak at best.

Figure 10 Lerner Index vs Herfindahl-Hirschman Index
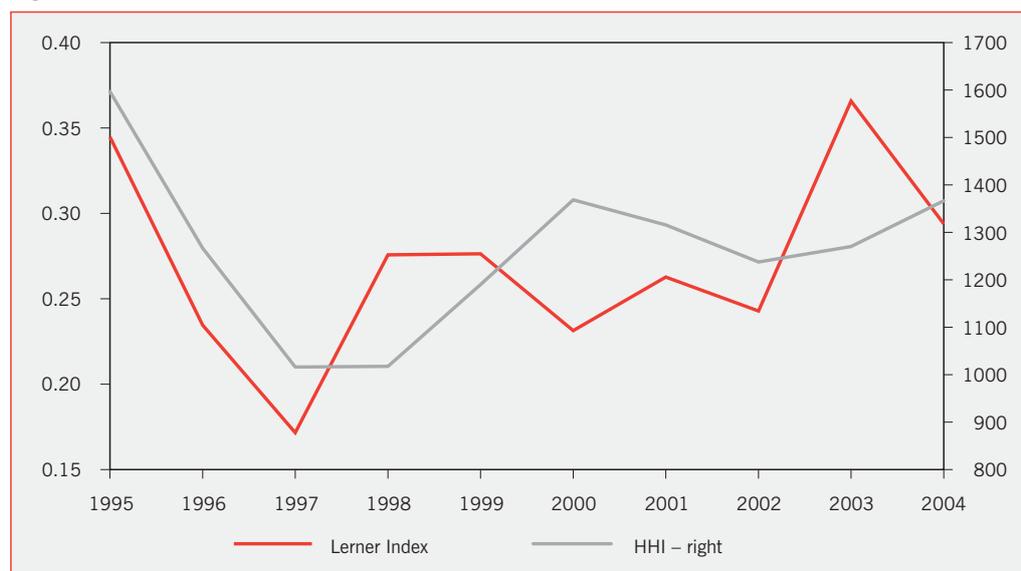
What can one conclude from these various estimates? I would suggest three things: first, at the least, there is no evidence that the greater concentration of the banking system since 1999 has resulted in decreased price competition. Looking at the Lerner Index estimates for all banks, mark-ups were somewhat lower in 2000–2002, after most of the exits and mergers, than they had been earlier. The decrease in competition (increase in mark-up) in 2003 is almost certainly due to the CNB's measures, and this was partly reversed already in 2004

It is true that, among large banks, mark-ups rose from 2001 to 2003. This increase preceded the 2003 measures. However, mark-ups fell in 2004, even as the number of banks continued to fall, suggesting that there have been no lasting increases in market power.

Second, there is evidence of increasing efficiency. Lower marginal costs, if coupled with non-increasing mark-ups, would mean benefits for consumers. In all the estimates, marginal costs were lower from 2001 on than they had been before (with the exception of the non-failed banks in 2002), and they were at their lowest historical level in 2004. These decreases in marginal costs represent important potential benefits to consumers.

Third, we should note that the apparently high level of competition in 1997 was partly the result of strong competition on the deposit side. This reduced mark-ups, but it can hardly be called healthy competition. As we saw from the regression analysis above, high deposit interest rates pushed up lending interest rates, and thus probably contributed to the adverse selection that caused the banking failures of 1998–1999.[2] For this reason, one should not put to much emphasis on relatively low estimated mark-ups in 1997.

3.6 Sources of Improved Efficiency: The Jeon and Miller Decomposition

The preceding tests have aimed at showing us the degree of competition. As a by-product, the Lerner Index analysis also gave us information about the evolution of marginal costs. This is very important, because one of the benefits we expect from increased competition is greater pressure to reduce costs, and greater efficiency. In this section, we will look more closely at the causes of efficiency gains in the banking system.

The preceding analysis shows that one's estimate of the amount of change in efficiency depends on whether one looks at all banks or only non-failed banks. To put it differently, it seems that the failed banks were less efficient than the survivors. Jeon and Miller (2005) propose a very interesting decomposition that allows us to measure the effects of exits on overall banking system efficiency. The method actually allows us to decompose efficiency gains into gains in the average level of efficiency (the "within" effect), gains in individual bank efficiency among banks remaining in the industry in a given year (the "between" effect), gains from entry of new banks and gains from exits of banks. They call their method the "Ideal Dynamic Decomposition".

Mathematically, the decomposition looks like this:

$$\Delta R_t = \Sigma \text{stay } r_{i,\Delta t}\, \overline{\theta}_i + \Sigma \text{stay } (r_i - \overline{R})\theta_{i,\Delta t} + \Sigma \text{enter } (r_{i,t} - \overline{R})\theta_{i,t} - \Sigma \text{exit } (r_{i,t-1} - \overline{R})\theta_{i,t-1}$$
$$\quad\ \text{"within"} \qquad\ \text{"between"} \qquad\qquad \text{"entry"} \qquad\qquad\ \text{"exit"}$$

R_t = Return on equity for banking system as a whole at time t.
$r_{i,t}$ = Return on equity for individual bank i at time t.
$\theta_{i,t}$ = Share of bank i in total banking system capital at time t.

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2   See Stiglitz and Weiss (1981) for the classic argument about how high interest rates can lead to adverse selection and credit rationing.

$$\overline{R} = (R_t + R_{t-1})/2$$
$$\overline{\theta} = (\theta_t + \theta_{t-1})/2$$
$$\theta_{i,\Delta t} = \theta_{i,t} - \theta_{i,t-1}$$
$$r_{i,\Delta t} = r_{i,t} - r_{i,t-1}$$

The idea behind the composition is actually fairly straightforward. The "within" effect multiplies the change in the bank's profitability times its average market share in the two years compared, and then adds this up for all banks that were in the market both in the given year and the year before. Thus, this effect looks at how much the overall level of profitability improved neglecting the change that occurred in banks' market shares.

The "between" effect multiplies the difference between the individual bank's profitability and the system average by the bank's change in market share, and again sums up for all banks. This term, then, tells us how much of the increase in profitability has occurred because more profitable banks have increased market share.

The "entry" effect then looks at the contribution of newly entered banks to overall system profitability in the given year, and the "exit" effect, in the same way, looks at the effect of eliminating the exiting banks.

Note that Jeon and Miller use return on equity to measure efficiency. One could question this terminology; perhaps performance would be a better word. In any case, I have calculated the decomposition for 1995 to 2003, and the results are shown in Table 5.

Table 5 Jeon-Miller "Ideal" Decomposition of Performance Change, in %

	Within	Between	Entry	Exit	Change in return on average assets
1995	4.4	–0.7	1.9	0.1	3.8
1996	0.9	1.0	–0.1	0.0	1.9
1997	3.6	0.1	–0.1	0.0	3.7
1998	–23.5	0.5	0.0	0.0	–23.1
1999	9.0	6.9	0.0	7.6	23.4
2000	0.5	2.4	0.0	0.2	3.1
2001	–10.5	7.2	0.1	0.0	–3.2
2002	9.8	–4.8	0.0	1.0	5.0
2003	0.7	1.8	0.0	–1.6	0.9
Total	–5.1	14.3	1.8	7.1	15.4

We can see that the "within" effect, or the change in average profitability, is usually the largest effect in a given year. The "within" effect is the result of macro-economic conditions, as well as broad changes in the efficiency of the banking system. However, over the whole period, the "between" effect contributes much more to the improvement in profitability. That is, individual banks' improvement

relative to the average, while in most years smaller than the change in the average, over time contributes more than any other factor to the increase in system profitability. Following Jeon and Miller, I would suggest that this "between" effect actually reflects the effects of competition in forcing banks to restructure and improve efficiency.

Entry is of relatively little importance both in the individual years and over the whole period, but exit is of great significance. Its effects are mainly concentrated in 1999, and to a much lesser extent in 2002.

If we now return to the Lerner Index discussion, and we recall that there was a much sharper fall in marginal cost over time when we included the failed banks, we see how this result depends on the strong exit effect. That is, the efficiency of the surviving banks does seem to have grown steadily, but the big jump in efficiency in 1999 and 2000 would seem to be more the result of exit of inefficient banks than the result of improved performance (and competition).

4 Conclusions

Despite decreases in the number of banks and increases in conventional concentration measures, survey evidence, the trend in interest rates, and the growth in the number of national competitors would seem to provide strong evidence of increased competition. However, more rigorous tests are somewhat less conclusive. According to the Panzar-Rosse h-statistic, Croatia's banking system is roughly as competitive as the banking systems of many EU member states, and similar to other transition countries with the exception of Poland, which appears to have a more competitive system. However, the Panzar-Rosse test does not provide clear evidence of increased competitiveness since 1999 or 2000.

According to the Lerner Index method, some improvement in price competition appears to have been achieved in 2000–2002. The mark-up, as measured by the Lerner Index, reaches a minimum in 2000 for both the group of non-failed banks and for banks with assets above HRK 500 million. The restrictive measures of the CNB probably account for the decrease in measured price competition (increase in the mark-up) in 2003.

At the same time, the marginal cost estimates obtained from the Lerner Index procedure point to significant efficiency gains in the years after 1999. The Jeon-Miller decomposition suggests that the efficiency gain implied by falling marginal costs has mostly come from improvements in efficiency at existing banks, supplemented in 1999 by the exit of inefficient banks. It seems reasonable to conjecture that increased competition has been the main force pushing banks to raise their efficiency.

This observation allows us to better understand the high and rising profitability of Croatian banks in recent years. Efficiency has grown and competition seems to be intensifying. Banks have passed some but not all of the efficiency gains on to customers. Interest rates have fallen and the quality and extent of services has im-

proved, but banks have managed to keep margins large enough to secure high profits. In other words, while competition has increased, because of strong efficiency gains and a certain degree of market power, banks have been able to maintain profits while lowering interest rate margins. If competitive pressures continue to increase, decreases in margins may outweigh efficiency gains, and profit rates may drop. However, this will depend on banks' ability to squeeze out cost savings, improve asset allocation and decrease losses on loans and other placements. If such efficiency gains continue rapidly enough, banks may be able to keep profit rates at current levels.

This report, in conclusion, finds that the current levels of market concentration in the Croatian banking system are not an impediment to market competition. Competition has been strong enough to produce significant efficiency gains, and these gains have resulted in benefits for consumers. However, this does not mean that further mergers would necessarily be benign. Any mergers among large players in the Croatian banking market will have to be scrutinized closely for possible negative effects on market competition.

Finally, it is important to stress that regulatory measures to stimulate competition are not limited to questions of mergers and acquisitions. Regulators may target specific contracts, agreements and practices that decrease competition. For this reason, a crucial area for further analysis is what measures might be needed, if any, to further increase competition and improve the price and quality of banking services offered to customers without endangering the safety and stability of the banking system.

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