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ABSTRACT

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I use a new Call Reports data item to revisit the role of advertising in US commercial banking. I examine how banks' advertising varies with the deposit market structure and whether bank profitability is influenced by advertising. My analysis addresses the endogeneity of market structure and advertising variables using instrumental variables. I find that banks advertise more with increasing market concentration, whereas banks with larger market shares and size advertise less. I also find that advertising has a positive and economically significant impact on bank profitability. These results suggest that advertising is an important aspect of bank competition.

JEL Classification: D40, G21 and M37
Keywords: depository institutions, market structure and non-price competition

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Submitted 04 January 2006

The Role of Advertising in Commercial Banking

1. Introduction

Any attentive observer cannot help but notice banks' advertising in print media, on billboards, radio and television. This is not surprising given the important sums depository institutions dedicate to this form of non-price competition. In 2004, U.S. commercial banks have spent an estimated $9.6 billion on advertising, which corresponds to 3.8% of industry non-interest expenses and 9.5% of industry net income.[1] Yet, we know surprisingly little on the role that advertising plays for banks.

Despite the obvious multi-dimensional nature of bank competition, financial institutions research has primarily focused on price competition (for a review see Degryse and Ongena, 2004).[2] This literature indicates that in line with the *structure-conduct-performance* hypothesis, banks with market power pay lower deposit rates (e.g., Berger and Hannan, 1989; Calem and Carlino, 1991) and charge higher loan rates (e.g., Hannan, 1991). Yet, how banks' advertising competition varies with the structure of the market in which they operate is still an open question. In fact, there is scant evidence whether depository institutions' advertising intensity (i.e., advertising expenditures per dollar of deposits) has any impact on their profitability in the first place. Moreover, most of the evidence on U.S. banks' advertising relies on data that predate 1990s, while the industry has substantially changed since then.

In the U.S. the number of commercial banks almost halved during the past 25 years, dropping from 14,435 in 1980 to 7,567 in 2004. During this period, many banks became larger through mergers and acquisitions, and entered new markets as geographic market entry restrictions were gradually removed, first at the state and then at the federal level. This not only has allowed banks to capitalize on economies of scale during 1980s and 1990s but also helped them to spread their operations over the

[1] Estimate based on Call Reports, the financial statements that all U.S. banks have to file with their regulators. Only banks that have advertising expenditures higher than 1% of their interest plus non-interest income are required to report them. The estimate is made by assuming that the median bank that is not required to report advertising expenses but reported them anyway is representative of those banks that are not required to report and, in fact, did not. Estimates for 2001, 2002, and 2003 are $7.9 billion, $8.6 billion and $8.5 billion, respectively. Projections that are based on the average bank were similar.

[2] Few studies have examined branch location and service hours as other forms of non-price competition in banking (e.g., Evanoff, 1988, Hegestad and Mingo, 1976, and White, 1976).

geographic space and diversify their local economy risk. Competition from credit unions, which are exempt from U.S. corporate income taxes, and non-bank financial services, such as money market mutual funds and finance companies, which are exempt from U.S. banking regulations, also stiffened during this period. Banks tried to counter non-bank intermediaries' competition by offering a wider range of products and services, such as insurance contracts, proprietary or third party mutual funds, and investment banking services, betting on the economies of scope related with financial intermediation. During the same time period, small banking institutions remained economically viable with more than 3,000 *de novo* banks being chartered since 1980 (DeYoung and Hasan, 1998). These dramatic changes suggest that the role of advertising may have increased in today's more competitive banking environment.

The literature on the role of advertising and its impact on firm performance and market structure is very extensive covering the fields of economics, marketing, management science and finance.[3] An informal treatise in economics dates back to Marshall (1890, 1919) who contrasts advertising's *combative role*, stealing competitors' customers without generating product information, versus its *constructive role*, providing information to customers. In modern economics the *persuasive view*, which is along the lines of Marshall's combative role, suggests that advertising is primarily conducted to change consumers' tastes to the advertiser's advantage (e.g., Braithwaite, 1928, Robinson, 1933, Kaldor, 1950, Bain, 1956, Comanor and Wilson, 1967). In this case, advertising generates a less elastic demand for the product/service by increasing brand loyalty, eventually leading to higher market concentration and higher prices to the detriment of consumers. Under the persuasive view advertising is also anti-competitive because sunk costs of advertising could deter potential entrants. In contrast, Marshall's constructive role has lead to the *informative view* according to which advertising creates a *more* elastic demand by providing information to customers (e.g., Ozga, 1960, Stigler, 1961, Demsetz, 1973, Nelson, 1974, 1975). This pro-competitive interpretation associates increased advertising with higher market entry and lower prices. A recent alternative to these theories is the *complementary view* (e.g., Stigler and Becker, 1977,

[3] This paragraph is largely based on Bagwell (2001, 2002) who provides excellent surveys of advertising economics.

Fisher and McGowan, 1979, Nichols, 1985, Hochman and Luski, 1988, Becker and Murphy, 1989). According to this view, advertising, now an argument in the consumer's utility function, does not change or shift tastes, but is "consumed" jointly with the good/service that is advertised. So defined, advertising can play an important role even in purely competitive markets or when it conveys no specific information.

Banking is a particularly interesting industry to examine the role of advertising. It is a mature industry with standardized products, which improves inter-firm comparisons. Importantly, in contrast to most advertising research which measures market share and concentration at the industry level, U.S. bank data allow accounting for the local nature of market competition. There are over 2,000 rural and urban deposit markets in the U.S. with significant variation in concentration, resulting in a rich empirical set-up.

An update on the role of advertising for banks appears to be overdue for a number of reasons. First, the most of the evidence for U.S. banks is dated, relying on data from 1960s, 1970s and 1980s (e.g., Lapp, 1976, Rhoades, 1980, Hasan, Hunter and Mathis, 2000).[4] Results based on pre-1990 data cannot be readily extrapolated to today's significantly more competitive banking environment. Second, all existing studies, except one, rely on bank survey or savings and loan (S&L) samples, neither of which may be representative of commercial banking population.[5] Third, alternative hypotheses, such as the *efficient-structure* hypothesis, have not been accounted for when examining bank advertising. Finally, findings on the role of advertising in banking are often contradictory. For example, estimating *advertising intensity-market structure* models, Rhoades (1980) finds that concentration has a negative but insignificant effect on advertising; Kohers and Simpson (1981) find a negative and significant effect; Hasan, Hunter and Mathis (2000) find a positive and significant effect; Scott (1978) observes that banks' advertising first increases then decreases with market concentration; whereas Wolken and Derrick (1986) fail to find evidence for such an "inverted-U" relation (unless otherwise noted, "significance" refers to statistical

[4] One exception is Dick (2005) who tests Sutton's (1991) theory of endogenous sunk costs involving advertising and service quality with a large sample of U.S. banks from 2002. Other studies using recent data are De Pinho (2000) and Caree (2000) who examine Portuguese and Russian banks' advertising competition, respectively.

[5] Again the exception is Dick (2005). Lapp (1976), Scott (1978), Kohers and Simpson (1981), Santos (1995), and Hasan, Hunter and Mathis (2000) use S&L data; whereas Edwards (1973, 1976), Rhoades (1980), and Wolken and Derrick (1986) use commercial bank survey data.

significance in the rest of the article). It appears that additional evidence would be welcome.

This study makes a number of contributions. First, it uses new data which allow the examination of bank advertising with the largest panel to date. Second, it revisits *advertising intensity-market structure* and *profitability-advertising intensity* models to shed light on the conflicting evidence. Third, it controls for the alternative efficient structure hypothesis that is left out in the existing bank advertising literature. Finally, given that profits, advertising and market structure variables are jointly determined in industry equilibrium, it uses Two-Stage Least Squares (2SLS) estimation to properly account for endogeneity of these variables. One caveat is that, to be able to properly link banks' advertising with their markets, I restrict the sample to single-market institutions. Moreover, bank advertising cannot be observed for all banks in the Call Reports. The resulting sample is composed of community banks: institutions that have less than one billion dollars in total assets and operate in a single market (e.g., DeYoung, Hunter and Udell, 2004).[6] Despite these restrictions, the sample covers more than a third of U.S. commercial banks during 2001-2004.

Results indicate that bank advertising varies significantly with market structure. Banks in markets with higher concentration advertise more, whereas banks with higher markets shares advertise less. There are also scale effects associated with advertising: banks advertise less per dollar of deposits as they grow in size. These results are obtained after accounting for the endogeneity of market structure variables. Equally importantly, bank advertising is found to have a positive and economically significant effect on profitability. This second major result is obtained after using instrumental variables for advertising, and is robust to the use of instrumental variables for market structure variables.

The paper proceeds as follows. The review in Section 2 focuses on the research that has tested advertising-related hypotheses for depository institutions. Section 3 details the data sources, the sample and the variables used. The empirical analysis consists of estimating advertising intensity-market structure regressions (section 4.1) and profitability-advertising intensity regressions (section 4.2) with 2SLS. Section 5 concludes.

2. Literature Review [7]

To date, only a limited number of studies have examined the role of advertising for depository institutions. One strand of literature examines whether there is a link between banking institutions' advertising expenditures and the structure of the market in which they operate. Another strand examines whether advertising helps increase depository institution profits.[8] Neither of these strands provides conclusive results.

2.1. Advertising Intensity-Market Structure Relation

If advertising is an important competitive tool for depository institutions, then we should observe systematic variations in advertising given changes in the market structure. Although significant coefficient estimates for market share and/or concentration would not necessarily suggest causality, they would be indicative of the relevance of advertising for banking institutions. In fact, in the long-run market structure is endogenous, an issue that I address in the empirical analysis.

Firm's dominance in the market place and its advertising are likely to be linked. Brozen (1974) suggests that firms with smaller market shares would have higher advertising intensities as they try to steal customers away from the dominant firms in the market. Advertising intensity would be lower for dominant firms as they would have little customer base left for potential expansion. Under the Brozen hypothesis (1974) advertising intensity and market share would be negatively related. Alternatively, a positive relation between advertising and market share can also be observed. For example, Sutton (1991) suggests that advertising can serve as an endogenous sunk cost that dominant firms with large market shares strategically invest in, in order to increase entry barriers.

Four studies have examined the relation between depository institutions' advertising intensity and

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[6] I check robustness with the sample of banks that collect at least 75% of their deposits from a single market.

[7] The focus here is on research that has examined advertising's role for depository institutions. A comprehensive review of advertising economics is beyond the scope of this article.

[8] A third strand of banking literature estimates models of *market concentration-advertising intensity* relationship to test *the Telser hypothesi*s (Edwards, 1973, and Kohers and Simpson, 1981). Telser (1964) argues that if advertising can help increase market power, then market share variability should decrease with advertising. I cannot properly test this hypothesis because my sample is restricted to single-market banks. In the absence of large multi-market banks, testing the link between market share variability and individual banks' advertising

their market share with conflicting results. Edwards (1976) finds support for the Brozen hypothesis: advertising intensity regressed on market share has a negative and significant coefficient estimate. However, his analysis relies on a highly restricted sample of 29 large single-metropolitan-market banks in 1965 and does not control for market concentration. Scott (1978) finds that savings banks with higher market share have higher advertising intensities, but those with higher market share that operate in more concentrated markets have lower advertising intensities, suggesting that dominant firms advertise less. His analysis relies on 125 savings banks that wholly operated in one of the 11 Massachusetts markets in 1972 and excludes commercial banks operating in the same markets. In contrast, Wolken and Derrick (1986) fail to find a significant relation between advertising intensity and market share when examining a sample of 550 single-market banks operating in 367 markets that participated in the Federal Reserve System's (the Fed) Functional Cost Analysis (FCA) survey in 1978. Finally, Dick (2005), tests for Sutton's (1991) theory of sunk advertising costs (as part of investment in quality) and industry structure with more than 6,600 bank-market observations and finds that advertising intensity is higher for dominant banks than it is for fringe banks operating in the same markets. [9]

A large number of studies in advertising economics have examined the relation between advertising intensity and market concentration. A starting point is the seminal work of Dorfman and Steiner (1954) who model profit-maximizing monopolist's optimal level of advertising as the ratio of advertising elasticity of demand to the price elasticity of demand. This flexible model provides valuable insight as to how the firm may adjust its advertising policies given the characteristics of the market it faces. For example, Lapp (1976) adopts Dorfman and Steiner model to depository institutions and suggests that advertising intensity should be higher in markets that deviate from perfect competition. He finds that in those markets where entry was controlled by regulation in early 1960s (hence entry could not occur endogenously) higher concentration was positively related to advertising intensity. However, his results are not corroborated by other banking studies. In the first study to examine the role of advertising

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would have lead to biased results.

for banks, Edwards (1976) fails to find any significant relation between advertising intensity and market concentration, although his evidence is based on a highly restricted sample from a 1965 survey of 36 large-banks. In contrast, Rhoades (1980) finds a negative but insignificant coefficient estimate for the concentration ratio using a sample of 524 commercial banks that operate in 172 urban and 64 rural markets in 1976. Kohers and Simpson (1981) on the other hand find that advertising intensity decreases significantly as market concentration increases. Their evidence comes from 200 S&Ls operating in 75 markets in five Southeastern states in years 1972, 1974 and 1976. In contrast, Hasan, Hunter and Mathis (2000) find that increases in market concentration leads to decreases in advertising intensity. They estimate a system of equations, where advertising and profitability are endogenous, for a panel of approximately 500 single-market S&Ls from Southeastern U.S. over 1985-1989. DePinho (2000) comes up with a similar conclusion using a panel of 23 Portuguese banks over 10 years to estimate a system of equations where advertising, branching and deposit interest rates are endogenous.

These conflicting results may also be due to the fact that these banking studies failed to allow for the *inverted-U* shape that is observed in the empirical advertising economics literature (e.g., Kaldor and Silverman, 1948, Greer, 1971, 1973, Sutton, 1974). One interpretation that is consistent with this empirical regularity is that product differentiation plays little or no role in perfect competition or for the monopolist, but it is important for the oligapolistic competition. Economic theory would suggest that price-taker firms can sell as much as they can produce whereas the monopolist needs no product differentiation as it has no competitors. As market structure deviates towards first monopolistic competition and then to oligopoly product differentiation becomes more important, and the role for advertising increases. Moreover, the empirical regularity appears to be more prevalent industries where most of the sales go to final customers, rather than industries producing intermediate goods (Buxton, Davies and Lyons, 1984; and Uri, 1987), suggesting that an inverted-U shape may also prevail in banking. Even though regressions of advertising intensity on market concentration fail to discriminate

[9] Dick (2005) obtains a larger sample after extrapolating advertising expenses for those banks that do not report them based on a regression of advertising on non-interest expenses.

whether advertising is persuasive or informative in nature nor do they necessarily suggest that market structure causes advertising, they are informative regarding the importance of advertising in a particular industry.

Scott (1978) tests the inverted-U hypothesis using a sample of 125 single-market S&Ls operating in 11 Massachusetts markets in 1972. He finds support for the inverted-U hypothesis: the coefficient for concentration is positive and significant and the coefficient for the squared-concentration is negative and significant (his specification includes non-linear market share terms as well). In contrast, Wolken and Derrick (1986) fail to find support for the inverted-U hypothesis using a sample of 550 single-market banks operating in 367 markets that participated in the Fed's FCA survey in 1978.

The conflicting evidence on the relation between advertising intensity and market structure can be due to a number of reasons. Many studies on depository institutions' advertising use small samples (e.g., Edwards, 1974, 1976, Scott, 1978, de Pinho, 2000). Others use thrift data because S&Ls were required to report advertising expenditures when commercial banks were not. However, thrifts may not be representative of commercial banks. The former are required to invest a significant proportion of their assets in mortgages and mortgage backed securities, whereas the latter do not face restrictions on the type of loans that they can offer. Moreover, before 1990s most S&Ls were mutually owned by their depositors, whereas commercial banks had corporate-type ownership structure: managers of mutually owned S&Ls advertise significantly less those that are owned by shareholders (Hasan, Hunter and Mathis, 2000). Other bank advertising studies have relied on commercial bank data collected by the now defunct FCA surveys which are based on voluntary participation and are subject to self-selection bias (Ors, 2004). Finally, none of the studies cited above, with the exception of Lapp (1976), accounts for the endogenous nature of market structure, as advertising is likely to shape market structure in industry equilibrium (e.g., Sutton, 1991).

2.2. Profitability-Advertising Intensity Relation

Given the large sums that banks spend on advertising, an important question is whether such spending has any impact on their profitability. In the advertising economics literature Bain (1956) and

Comanor and Wilson (1967, 1974) were the first to study profitability-advertising intensity relation as an indirect test of the persuasive view. According to this view, advertising can be used to create product differentiation and brand loyalty (e.g., Braithwaite, 1928, Robinson, 1933, Kaldor, 1950). As consumer loyalty to brands that advertise more increases, entry by other firms becomes more difficult: over and above the sunk capital costs, new entrants would have to incur sunk advertising costs to let their product be known and to persuade consumers to switch from incumbent firms to entrants. If advertising can help create entry barriers then, in industry equilibrium, firms that advertise more would enjoy market power and be able to charge higher prices. After controlling for industry concentration, demand growth, scale effects, and capital requirements, Comanor and Wilson (1967, 1974) find a strong positive relation between profits and advertising using industry-level data. Their findings are supported by a large body of work, establishing a "stylized fact" for non-financial sectors (Bagwell, 2002, p.44).

Although the *Comanor-Wilson hypothesis* is one of most commonly tested relations in the advertising economics literature, only four papers examined advertising's potential role on banks' profitability. In contrast to the established "stylized fact" for non-financial firms, banking studies find no systematic positive relation between profitability and advertising. Edwards (1973) regresses return on equity (ROE) on advertising scaled by gross income, deposit market share, concentration and growth for a 1965 sample of 36 large banks that responded to a survey of the Fed. He finds a negative but insignificant coefficient for advertising intensity. Kohers and Simpson (1981) regress ROE on advertising intensity, Herfindahl index of market concentration, personal income growth, and the log of S&L total assets. The coefficient estimate for advertising intensity is negative in 1972 and 1974, and positive in 1976, but never statistically significant. Santos (1995) estimates a vector autoregressive model of gross profits, advertising dollars, and number of institutions using 1960-1989 data on S&Ls located in Massachusetts. He fails to find that advertising Granger-causes gross thrift profits. Finally, Hasan, Hunter and Mathis (2000) find that, after controlling for market concentration, advertising has a negative effect on ROA which is only marginally significant (at 10% level) for single-market thrifts. However, Hasan, Hunter and Mathis (2000) results may also be due to the fact that their sample includes both

mutual and stock-type S&Ls. The managers of S&Ls that are mutually owned by their depositor-members may not use advertising as a competitive tool to the same extent as managers of shareholder-owned common stock-type institutions.[10]

In fact, the finding of no association between bank profitability and advertising is all the more surprising given the recent evidence that suggests that advertising helps mold market structure in the U.S. In line with Sutton's (1991) predictions, Dick (2005) finds that advertising and quality are endogenous sunk costs that banks strategically invest in. The resulting industry equilibrium consists of oligopolistic markets dominated by few large institutions in markets of all sizes, with a competitive fringe that marginally comes into play in larger markets. If advertising is a strategic sunk cost that helps shape market structure then, one would expect to see a link between profitability and advertising.

One important issue that remains to be addressed is the endogenous nature of advertising expenditures which has long been recognized in the literature (e.g., Bain, 1956, pp. 191, 299; Greer, 1971; Martin, 1979). It is very likely that in the short-term advertising and profits are jointly determined, together with market share and concentration in the longer-term. For example, Ehrlich and Fisher (1982) find that for the broadly defined financial sector, industry advertising demand increases with sales. In the bank advertising literature few papers properly address the problem of endogeneity. Lapp (1976) specifically works with a sample of S&Ls during a period when market entry is controlled by regulators, which leads to an exogenous market structure. Hasan, Hunter and Mathis (2000) estimate two stage least squares (2SLS) models where ROA, promotional expenditures, risky assets to total assets ratio and purchased funds to total assets ratio are endogenous. In their model market concentration is presumed to be exogenous.[11] Finally, DeYoung and Ors (2004) estimate a fixed-effects model where deposit prices

[10] Hasan, Hunter and Mathis (2000) include an ownership-type indicator variable which shows that mutually owned S&Ls advertise less. However, they do not interact this dummy variable with the advertising variable when ROA is the dependent variable. In contrast, there are no mutual institutions in my sample.

[11] De Pinho (2000) estimates a system of equations using seemingly unrelated related (SUR) regressions where the dependent variables (advertising, deposit interest rate and branches) are *not* endogenous to the system. Similarly, Caree (2000) estimates a system of equations with SUR for a panel of 56 Russian savings banks where deposit interest rate, advertising and market share are the dependent variables.

and advertising intensity are endogenous.[12] I address the endogeneity problem using 2SLS with separate instruments for advertising intensity, market share and concentration.

3. Data Sources, the Sample and the Variables

Commercial bank data are obtained from the year-end Call Reports 2001 through 2004. Federal Deposit Insurance Corporation (FDIC) Summary of Deposits datasets are used to construct deposit market share, concentration, and growth variables. Local banking markets are defined as the larger of county, Metropolitan Statistical Area (*MSA*), or Consolidated-MSA (CMSA) markets.[13] This is in line with the recent evidence which shows that the markets for depository services remain largely local (Amel and Hannan, 1999, Amel and Starr-McCluer, 2002).

A number of restrictions are placed on the sample, which starts in 2001 because advertising expenditures started to being reported in the Call Reports that year. First, savings institutions are excluded from the analysis due to significant differences in their regulatory requirements. However, in the calculation of the market structure variables savings banks and S&Ls are accounted for. Second, banks with zero or negative deposits (credit card banks), zero or negative total loans or assets are dropped from the sample. After these two restrictions 30,529 bank-year observations from 8,210 commercial banks remain over 2001-2004. Third, I restrict the sample to commercial banks that collect all of their deposits from a single market. This restriction is necessary to properly match banks with the characteristics of their markets as Call Reports provide bank-level rather than bank-and-market-level advertising expenditures. This third restriction reduces the dataset to 20,119 bank-year observations from 5,735 banks during 2001-2004. Fourth, I further restrict the sample to established banks by eliminating banks younger than nine years. Life-cycle studies in banking show that it takes as long as nine years for

[12] DeYoung and Ors (2004) treat market share and concentration as exogenous in the short-run, which is appropriate in fixed-effects regression where the focus is on short-term changes (e.g., Kennedy, 2003, p.308).

[13] The U.S. Office of Management and Budget defines the MSAs which must include at least one city with 50,000 inhabitants, a U.S. Census Bureau defined urban area, and a total metropolitan population of at least 100,000 (75,000 in the New England region). An area that has one million or more inhabitants is defined as a CMSA which may include a number of MSAs and counties.

de novo institutions to reach profitability and efficiency of established banks of similar size (DeYoung and Hasan, 1998 and DeYoung, 2000). This last restriction reduces the sample to 16,427 bank-year observations from 4,608 banks for which the descriptive statistics are provided in Table 1.

A final restriction is imposed by the fact that not all commercial banks report their advertising expenses. Since March 2001, federal regulators require banks to report their advertising and marketing expenses in the Call Reports (item RIAD0497) if these exceed one percent of their operating income (interest plus non-interest income). This criterion is met by 11,574 bank-year observations by 4,462 banks over 2001-2004 (before the application of the four restrictions mentioned above). The resulting censoring problem is somewhat mitigated by the fact that 2,504 banks report their advertising expenses even though they do not meet the reporting requirement, providing an additional 5,702 bank-year observations. Once the above mentioned restrictions are applied, the sample of mature single-market banks for which advertising is observable is reduced to 8,705 bank-year observations from 3,056 banks. Even though reduced, this sample of single-market banks still accounts for 37% of all the U.S. banks over 2001-2004.[14]

Table 1 shows the descriptive statistics for the sample. All financial ratios are winsorized at the 1st and 99 percentile of their distributions so that the regressions results will not be driven by the few outlier observations that typically arise when calculating ratios. All dollar amounts are in constant 2004 dollars. The average bank in the sample spends 9.49 *cents* on advertising per dollar of deposits (median bank spends 8.29 cents). The sample consists of single-market community banks: 98% of the sample banks have total assets (*TA*) less than 1 billion dollars. The average bank in the sample has *TA* of 276.4 million dollars which is significantly smaller than the 2001-2004 population average of 811.3 million (based on 30,529 bank-year observations, not reported in the table). On the other hand, the performance measures show much smaller differences. Return on assets (return on equity) is calculated as the ratio of

[14] To check the robustness of my results, I also examine a larger sample of 11,121 bank-year observations from 3,874 banks which (i) collect at least 75% of their deposits from a single market, (ii) have nine or more years of age, and (iii) for which advertising expenditures are available.

operating income minus operating expenses which *excludes* advertising expenses to *TA* (total equity).[15] For example, the average bank in the sample has a *ROA* of 0.0145 (1.45%) whereas the average bank in the population has a *ROA* of 0.0131 (not reported in the table). Similarly, the average bank in the sample has an *ROE* of 0.1432 (14.32%) whereas the *ROE* for the average bank in the population is 0.1363. X-efficiency estimates that are obtained from stochastic minimum-cost frontiers show little difference between the sample and the population: *XEFF* has a mean of 0.8360 (83.60%) for the sample, 0.8356 for the population.[16] Urban banks constitute 42.22% of the sample. The average urban bank has a market share (*MS*) of 0.0172 (1.72%) and operates in a market that has a Herfindahl index (*CONC*) of 0.1166. In contrast the average rural bank in the sample has a *MS* of 0.2261 (22.61%) and operates in a significantly more concentrated market (*CONC* = 0.2643). The next section presents the empirical analyses and their results based on this sample.

4. Empirical Analysis and Results

In this section, I examine, first, how bank advertising varies with market structure after accounting for the endogenous nature of market share and concentration using instrumental variables. Second, I examine whether advertising increases profitability by estimating profitability-market structure regressions. Again, I account for the endogenous nature of advertising and market structure in the profitability regressions using instrumental variables.

4.1. Advertising Intensity - Market Structure Relation

I estimate the following advertising intensity-market structure model using (2SLS):

$$ADVTD_{i,t} = \beta_0 + \beta_1 MS_{i,t}^{IV} + \beta_2 CONC_{i,t}^{IV} + \beta_3 \left(CONC_{i,t}^{IV}\right)^2 + \beta_4 MSA_m + \beta_5 MKTGROWTH_{i,t} + \beta_6 RIVALSMARGIN_{i,t} + \beta_7 CONSLNSTL_{i,t} + \beta_8 \ln TA_{i,t} + \sum_{j=9,10,11} \beta_j YEAR_t + \varepsilon_{i,t} \quad (1)$$

[15] Empirical results do not change when *ROA* and *ROE* are calculated using net income as it is reported in the income statement *without* making any adjustments for advertising expenditures.

[16] X-efficiency estimates are obtained using data from bank population after subtracting "other non-interest expenses" (which inclusde advertising) from total costs. Refer to Section 4.2 and Appendix Table A1 for details.

where the superscript IV indicates the instrumented variables. I instrument market share using the logarithm of bank's age (ln*AGE*), cost X-efficiency estimate (*XEFF*) and the *MSA* dummy variable that indicates whether the bank's market is urban or rural. Berger and Dick (2005) find that early entrant banks have significantly higher market shares compared to subsequent entrants. Their findings would suggest that bank's date of entry into a market would be a good instrument for *MS*. While the precise date of market entry is not available to me, bank's age is. Since the banks in my sample bank are community banks that gather all of their deposits from a single market, age would be highly correlated with the date they entered their only market. The second instrument is suggested by the efficient-structure theory which asserts that X-efficient banks would increase their market share at the expense of their inefficient rivals. I also use *MSA* as an instrument for *MS* as the single-market bank that operates in an urban market is likely to have smaller market share than its rural counterpart. These instruments have the expected signs [(+) ln*AGE*, (+) *XEFF* and (–) *MSA*] and explain 32% of the variation in MS in the first-stage regression. The expected sign for β_1 is negative according to Brozen hypothesis (1974), whereas a positive coefficient estimate for *MS* would be consistent with the use of advertising as a sunk cost that helps deter entry.

Market concentration (*CONC*) is instrumented using the logarithm of the number of banks that operate in the same market (ln*MKTBNKS*) to account for the number of competitors and the logarithm of the market deposits (ln*MKTDEPS*) to account for the market size. ln*MKTBNKS* has the expected negative sign in the first stage regression. The coefficient estimate for ln*MKTDEPS* is positive which indicates that, after controlling for the number of banks, larger markets are more concentrated. These instruments help explain 56% of the variation in *CONC*. The instrumented market concentration and its square are included to test the inverted-U hypothesis which suggests a positive estimate for β_2 and a negative estimate for β_3.

In the empirical model (1) *MSA* indicator variable is included to account for unobservable differences in advertising intensity that may exist between urban and rural markets after controlling for market structure. *RIVALSMARGIN* is included to account for the profit opportunities in the bank's main

market. One implication of the Dorfman-Steiner hypothesis is that firms that face higher profit margins are likely to advertise more. *RIVALSMARGIN* is constructed as the weighted average interest margin of the bank's competitors, where the weights are rivals' market shares (which sum up to one). I include the ratio of bank's ratio of consumer loans to its total loans (*CONSLNSTL*) to account for business orientation which is assumed to be fixed by the bank's management in the long-term. Banks with higher *CONSLNSTL* are expected to have a retail orientation and advertise more than banks that have a wholesale orientation. I also include the logarithm of bank total assets (ln*TA*) to test for scale effects (Arndt and Simon, 1983): a negative coefficient estimate would indicate that advertising per dollar of deposits gets cheaper as the bank gets larger. Although I do not instrument ln*TA*, it is nevertheless treated as an endogenous variable.

The estimation results are presented in Table 2, where the stated t-statistics take into account the clustering of observations for the same bank across the years. In the first column, market concentration is allowed to affect advertising intensity in a linear fashion. The results indicate that the coefficient estimate for *MS* is negative and significant after controlling for market concentration: mature banks that operate in a single market advertise less if they have a larger share of the market. If the market size for the average bank in the sample were to be doubled, an increase of 0.1262 (12.62%), its advertising intensity would decrease by 0.0471 cents per dollar of deposits, a 51% drop given that the average bank advertising intensity is 0.0917 cents per dollar of deposits. This result is consistent with the Brozen hypothesis which states that smaller institutions advertise more to gain market share. The results also indicate that, controlling for *MS*, mature single-market banks advertise more in markets that are more concentrated. An increase in market concentration by 0.0200 that may be due to the merger of two rivals, increases advertising intensity by 0.0068 cents per dollar of deposits for the average bank in the estimation sample, a 7.5% increase.[17] These results suggest that advertising is an important form of non-price competition: changes in market structure are linked with economically significant changes in bank advertising intensity

[17] The increase of 0.0200 in the Herfindahl index follows the regulatory practice. The Fed does not, *a priori*, oppose bank M&As that do not raise local market Herfindahl over 0.1800 and by more than 0.0200 (e.g., Cetorelli, 1999).

for the mature single-market institutions in my sample. Further down in column 1, the coefficient estimate for *MSA* suggests that there is no significant difference in the *level* of advertising intensity when urban community banks are compared to rural community banks. Whereas advertising intensity is higher in deposit markets that grow, the result is only marginally significant. The return to financial intermediation in the market, as measured by *RIVALSMARGIN*, is negative and not significant. It would appear that there is no support for the Dorfman-Steiner hypothesis which suggests that banks advertise more when marginal return on advertising is higher. Alternatively, it could be argued that banks advertise mainly for non-interest income that is driven by non-traditional banking activities. It is also possible that *RIVALSMARGIN* is not a good proxy for the market level return on financial intermediation. The coefficient estimate for *CONSLNSTL* that proxies for business orientation is positive but not significant: This may be due to the fact that the banks in my sample are community banks that have similar retail orientation. In fact, the median *CONSLNSTL* is 0.0934 with an inter-quartertile range (between 25th and 75th quantiles) of 0.1060. Finally, the coefficient estimate for ln*TA* is negative and significant, indicating that there are scale effects associated with advertising. An increase of 25% in total assets for the median bank in the estimation sample, leads to a decrease of 0.0292 cents per dollar of deposits, a 35% decrease given that *ADVTD* for the median bank is equal to 0.0826 cents per dollar of deposits.

Column 2 of Table 2 presents the results when market concentration is allowed to affect advertising intensity in a non-linear fashion. The coefficient estimate for *CONC* is positive and significant, that for $CONC^2$ is negative and significant. Advertising intensity increases as market concentration increases, reaches its maximum at *CONC*=0.7333 $[= -\hat{\beta}_2 /(2\hat{\beta}_3)]$ and then decreases. These results provide *statistical* support for the inverted-U hypothesis. Advertising becomes an increasingly important competitive tool as banking markets increase in concentration. However, the maximum does not occur (and advertising spending does not start to decline) before the market becomes

highly dominated by one bank with few fringe banks acting as competitors.[18] If one considers the fact that the average Herfindahl index for the estimation sample is 0.1915 (median is 0.1616), these coefficient estimates indicate that the overwhelming majority of markets in the sample are in the increasing segment of the inverted-U. In fact, in the estimation sample only 25 bank-year observations belong to markets with *CONC* higher than 0.7333. The evidence for the inverted-U hypothesis is not economically significant. Given these results, market concentration is modeled in a linear fashion in the rest of the analysis. The other results in column 2 are consistent with those observed in column 1: advertising intensity decreases as MS and bank size decrease, market growth has a positive but marginally significant impact, *RIVALSMARGIN* and *CONSLNSTL* have no significant impact.

Columns 3 and 4 of Table 2 present the estimation results for the subsamples of banks that operate in a single urban and rural market, respectively. The results for market share and concentration variables are similar to those in column 1, however the coefficient estimates are much larger for urban markets. This indicates that the economic impact of and increase *MS* or *CONC* are significantly larger in metropolitan markets. If the market size of the average urban bank were to be doubled (an increase in *MS* of 0.0174), its advertising intensity would decrease by 0.0249 cents per dollar of deposits. This corresponds to a 24% decrease given that the average advertising spending is 0.1034 cents per dollar of deposits. An increase in market concentration of 0.0200, in its turn would lead to an increase in advertising spending by 0.0133 cents per dollar of deposits, a 13% increase given the average level of advertising intensity. A similar exercise for rural banks suggests that for similar impacts much larger changes in *MS* and *CONC* are required. For example, doubling of the average market size for urban banks (which is 0.2077) would lead to a decrease of 0.0210 cents per dollar of deposits in advertising spending. Whereas an increase in the Herfindahl index by 0.0200 would increase advertising spending by only 0.0018 cents per dollar of deposits.

Deposit market growth (*MKTGROWTH*) and advertising spending are positively related for rural

[18] As an example, Herfindahl index would be equal to 0.7338 if a market were to be dominated by a bank that controls 85% of the market and the remaining 15% of the market was shared equally by two fringe banks.

banks, and this effect is significant. The same relation is negative but only marginally significant for urban banks. This may be due to the fact that rural banks are smaller in size and rely more on core deposits than urban banks. *RIVALSMARGIN* and *CONSLNSTL* have positive but insignificant coefficient estimates for the urban banks. The coefficient estimate for bank size is negative and significant for banks in urban markets, negative yet small and not significant for banks in rural markets. This result is consistent with the fact that the average urban bank in the sample has total assets of 583.4 million dollars (in constant 2004 dollars) whereas the average rural bank has only 79.6 million. Rural banks are too small to enjoy significant reductions in advertising spending that are associated with scale effects.

I conducted a number of checks to examine whether the results presented in Table 2 are robust. I used an alternative definition of advertising intensity by dividing advertising expenses by bank's total assets (*ADVTA*). *ADVTD* presumes that the bank advertises primarily deposit product and services, whereas bank production is by no means limited to these. Using *ADVTA* did not lead to materially different results. I also expanded the sample to banks that collect at least 75% of their deposits from a single market, which resulted in 10,642 bank-year observations. All of the main results remained qualitatively the same.

One question that remains is whether the obtained results are due to the selection biases inherent in the sample. As described earlier, advertising expenditures are only observed for approximately one-third of the population of banks due to reporting requirements imposed by the federal regulators, and this sample is further restricted to banks that obtain all of their deposits from a single market. To address whether selection bias could be driving the observed results, I estimate the same advertising-market structure model using Heckman's correction (1976, 1979). In this case, the predicted values of the instrumented market structure variables from the first-stage regression were used when estimating the advertising intensity-market (structural) model together with the selection model. The results in Appendix Table A2 suggest that selection bias does not drive the results presented in Table 2: the coefficient estimates obtained from Heckman's model (second column) are very similar to those obtained from the IV-regression (first column which replicates column 2 of Table 2) both in magnitudes and in

significances.

Admittedly, this is not the strongest possible rejection of potential sample selection bias. The selection model involved in Heckman's correction is, inevitably, ad hoc. The explanatory variables try to capture the selection process through the various income and cost ratios as the regulatory requirement is to report advertising expenditures if these exceed one percent of operating income, although 2,504 banks report even though they are not required to. Banks that have higher interest income are less likely to be included in the sample, whereas banks that have high "other non-interest expenses" to total assets ratio are more likely to be included in the sample.[19] The χ^2 statistic indicates that Heckman's model is significant. The estimate of the inverse of Mill's ratio, λ, which corrects for the selection bias, is also significant. On the other hand, the probit selection model has an R^2 of 0.0116. Despite these concerns, the fact that many banks report their advertising expenditure even they do not meet the criterion imposed by the regulators is probably the most important reason why results in Appendix Table A2 do not change materially when selection bias is controlled for.[20]

The finding that bank advertising intensity increases with market concentration is in line with Lapp (1976). Evidence presented here is in contrast to the findings of Edwards (1976), Rhoades (1980) and Kohers and Simpson (1980) who find no link or find a negative link between advertising and market concentration. I also find that although there is statistical support for an inverted-U (in line with Scott, 1978, but in contrast to Wolken and Derrick, 1986), the evidence lacks economic significance in the sense that the inverted-U is maximized at a very high level of market concentration. The results that I obtain for *MS* are in contrast to those of Scott (1978) and Wolken and Derrick (1986) who fail to find a significant relation between advertising and market share. Finally, in contrast to Edwards (1976) and Rhoades

[19] "Other non-interest expenses" excludes (i) salaries and employee benefits, (ii) expenses of premises and fixed assets", (iii) amortization expense of intangible assets; but includes (a) advertising and marketing expenses, (b) data processing expenses, (c) directors' fees, (d) printing, stationary, and supplies, (e) postage, (f) legal fees and expenses, and (g) FDIC deposit insurance assessments.

[20] Alternatively, one could estimate equation (1) with the *within estimator* using fixed bank-effects. Compared to OLS estimation on pooled data, fixed-effects estimator would have the advantage of controlling for the unobservable bank characteristics. Unfortunately, there is little time-series variation during the four years for which I have data available. When *within estimator* was used, fixed-effects explained almost all of the variation

(1980), I find significant scale effects in bank advertising. Next, I examine is whether bank profitability increases as a result of higher advertising, after controlling for other hypotheses that might explain profitability.

4.2. Bank Profitability - Advertising Intensity Relation

In this section I test *the Comanor-Wilson hypothesis*: if advertising can be used for product differentiation, then in industry equilibrium we should observe a positive relation between bank profits and advertising.

When examining the effects of advertising on profits it is important to control for other possible explanations of bank profitability. One alternative is the traditional s*tructure-conduct-performance* hypothesis which suggests that higher profitability is due to higher market power. Evidence indicates that banks operating in more concentrated markets charge higher loan rates (e.g., Hannan, 1991, Corvoisier and Gropp, 2002) and pay lower deposit rates (e.g., Berger and Hannan, 1989; Calem and Carlino, 1991) pointing to the sources of higher profits for banks with market power. It is also possible be that these rents cannot be extracted except by the banks that have large market shares, as it is stated by the *relative-market-power* hypothesis (Shepherd, 1982). In line with the research on profitability and market structure (e.g., Berger, 1995) I use the Herfindahl index of market concentration (*CONC*) and bank market share (*MS*) to test for the structure-conduct-performance hypothesis. One difference here is that, these variables are instrumented to account for their endogenous nature in industry equilibrium. For *CONC* and *MS* I use the instruments depicted in section 4.1.

A second alternative is *the efficient-structure* hypothesis which suggests that higher profits can be due to industry best-practices adopted by the firm's management (e.g., Demsetz, 1973).[21] To control for this alternative explanation of profitability, I use X-efficiency estimates (*XEFF*) that are obtained from annual minimum-cost frontiers that cover the whole industry (refer to Appendix Table A1 for more

in the explanatory variables. This suggests a high-correlation between the fixed bank effects and the explanatory variables, and also rules out the *random effects* estimator.

detail). Ideally, one would explicitly define advertising as a production input in the cost frontier specification. Otherwise using X-efficiency estimates alongside advertising intensity ratio as explanatory variables would underestimate the effect of advertising on profitability: since bank total costs include advertising expenditures, if advertising is not included as an input in the cost frontier specification the cumulative error term from which the cost X-efficiency estimates are obtained would also incorporate advertising. Unfortunately, advertising cannot be readily defined as an input of bank production when estimating a minimum-cost frontier for the population of banks, because advertising cannot be observed for all banks. One could estimate a minimum-cost frontier that only includes banks that report their advertising expenses but, this would lead to highly biased X-efficiency estimates. Instead, I estimate the minimum-cost frontiers after deducting from total costs the "Other Non-Interest Expenses" which is inclusive of advertising expenses. This income statement item is reported by all banks even when they do not separately report their advertising spending. In the 2SLS estimation *XEFF* is treated as an endogenous variable.

Third, bank profits may be higher due to higher service quality for which banks customers are likely to be willing to pay higher fees and loan interests and be paid lower deposit rates. More importantly advertising and service quality are highly likely to be jointly determined. Examining survey data Kiser (2002) finds that bank customers value service quality in deciding whether to maintain or switch household deposit accounts. This suggests that service quality could lead to higher profits because customers are willing to pay higher prices and fees that the bank with higher service quality can charge. It also suggests that advertising may inadvertently proxy for service quality if the latter is not explicitly controlled for. As in Dick (2005, 2006) I use the number of full-time equivalent employees per branch (*FTEBR*) as a correlate of service quality: the customer waiting times should be reduced as the number of employees tending to them per branch increases. Of course, higher values of *FTEBR* can also indicate cost inefficiencies at the bank. The use of *XEFF* should attenuate this last possibility, as would the use of

[21] I do not test for scale-efficiency version of the *efficient structure hypothesis*, which is tested and rejected by Berger (1995). My sample consists of single-market community banks. I cannot conduct meaningful tests of

instrumental variables for advertising intensity, the method followed in my analysis.

I estimate *bank profitability-advertising intensity* relations after adding instrumented advertising intensity (*ADVTD*) to the reduced-form equation in Berger (1995):

$$\pi_{i,t} = \beta_0 + \beta_1 CONC^{IV}_{m,t} + \beta_2 MS^{IV}_{i,t} + \beta_3 XEFF_{i,t} + \beta_4 MSA_m + \beta_5 MKTGROWTH_{m,t} + \beta_6 ADVTD^{IV}_{i,t} + \beta_7 FTEBR_{i,t} + \sum_{j=8,9,10} \beta_j YEAR_t + \varepsilon_{i,t} \quad (2)$$

where, profitability (π) is measured by *ROE* or *ROA*. Accountants obtain net income, which is used in the nominator of performance measures, after subtracting all expenses, including advertising expenditures, from the operating income. This could potentially bias my tests when advertising is included as an explanatory variable in the regression. To guard against this problem, I use an adjusted-net income in the calculation of *ROA* and *ROE* that *excludes* any advertising expenditures.[22] Advertising intensity *ADVTD* is instrumented using the variables in equation (1).

Panels A and B of Table 3 present the results with *ROA* and *ROE* as the dependent variable, respectively. Columns 1 through 3 in both panels present the 2SLS results with *ADVTD* instrumented using model (1). Columns 4 through 6 present the 2SLS results when *ADVTD* is instrumented alongside *MS* and *CONC* (which are instrumented separately) and with *XEFF* and *FTEBR* treated as endogenous variables (that are not instrumented separately).

Results in column 1 of Panel A provide estimates of Berger's (1995) reduced form regressions for my sample of mature single-market banks for which advertising is observable. The findings are comparable to those of Berger (1995): banks operating in more concentrated markets have lower *ROA*, whereas banks with higher market share and higher cost X-efficiency have higher *ROA*. These results suggest that the relative-market-power hypothesis is supported by the data, whereas the traditional structure-conduct-performance hypothesis is not. X-efficiency is positive and statistically significant in

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scale-efficiency in the absence of large (multi-market) banks.

[22] This potential problem is unlikely to be a concern with IV regressions, the method followed here, provided that good instruments for advertising intensity can be found. In any case, using *ROA* and *ROE without* adjusting total expenses for advertising expenditures did not change the results.

all of the years, providing strong support for the efficient-structure hypothesis. Column 2 of Panel 3A presents the results when instrumented advertising intensity is added to the specification in column 1. The coefficient estimate for advertising is positive and statistically significant. Further, it has a significant economic impact as well: if the level of advertising intensity for the average bank in the estimation sample (0.0917 cents per dollar of deposits) were to be increased by 25%, *ROA* would increase by 0.0028 or by 28 basis points, a 20% increase in the average *ROA* of 0.0142 (1.42%).

In column 3 of Panel 3A, *FTEBR* is added to the specification. Advertising intensity may serve as an unintended proxy for service quality if the latter is not explicitly controlled for. This does not appear to be the case: the coefficient estimate for *ADVTD* remains positive and significant after the addition of *FTEBR*. However, the coefficient estimate for *FTEBR* is negative and significant, which goes against the reasoning that higher service quality (as measured by higher number of employees per branch) should generate higher profits. Even though cost X-efficiency is explicitly controlled for in the specification, *FTEBR* could still proxy for inefficiency. Alternatively, it could also be that these tests are not adequately specified because the endogenous nature of service quality, as well as market share, concentration, and cost X-efficiency were not recognized.

This last concern is addressed in columns 4 through 6 of Panel 3A. In these specifications *ADVTD*, *MS* and *CONC* are instrumented separately and *XEFF* and *FTEBR* are treated as endogenous variables in 2SLS regressions. Importantly, bank advertising still has a positive and significant impact on bank *ROA*. The economic impact of an increase in advertising on *ROA* in column 5 is very similar to that in column 2. When treated as an endogenous variable, *FTEBR* is positive but not significant. There is no proof that the endogenous service quality leads to higher profits in my sample. Interestingly, the results for *CONC* and *MS* are no longer robust. In the absence of *ADVTD* (column 4), the instrumented *CONC* and *MS* change signs with respect to their non-instrumented counterparts (column 1). When *ADVTD* is added they retain the signs observed in columns 1 through 3, but they are no longer significant. It appears that it matters to properly account for the endogeneity of key variables, at least in my sample.

Results obtained with *ROE* as a measure of profitability in Panel 3B corroborate those obtained

with *ROA* in Panel 3A. For example, the coefficient estimate for *ADVTD* in column 5 suggests that increasing advertising expenses by 25% for the average bank (an increase of 0.0229 cents per dollar of deposits) leads to an increase of 0.0447 in *ROE* (4.45%). Given that the sample average for *ROE* is 0.1430 (14.30%), this amounts to a 31.2% increase in profitability at the sample's average. In contrast to Panel 3A however, in Panel 3B the coefficient estimates for the instrumented market structure variables (columns 4 through 6) are more in line with Berger (1995) findings, as opposed to their non-instrumented versions (columns 1 through 3). In columns 4 through 6, the coefficient estimates for *CONC* indicate that mature single-market banks that operate in more concentrated markets have lower *ROE*, a result that contradicts the traditional version of the structure-conduct-performance hypothesis. In the same columns, banks with higher *MS* have significantly higher *ROE*, a result that supports the relative-market-power hypothesis. These findings are robust to the addition of *ADVTD* and *FTEBR* to the specification.

The results in column 3 of Panel 3B show that *FTEBR* has a negative but only marginally significant coefficient estimate, whereas its coefficient estimate for *FTEBR* is negative and significant in column 6 where it is treated as an endogenous variable. Presuming that *FTEBR* adequately proxies for service quality, these findings suggest that the availability of more tellers per branch decreases, rather than increases, profitability. A likely interpretation is that *FTEBR* does not provide an adequate proxy for service quality. Unfortunately, the question concerning how best to account for the elusive service quality proves difficult to unravel.

Limited prior evidence suggests a negative link or no link between advertising and bank profits (e.g., Edwards, 1973, Kohers and Simpson, 1981, Hasan, Hunter and Mathis, 2000). In contrast, I find that advertising has a positive and significant impact of the profitability of banks that are in my sample. This result suggests that advertising is an important tool in non-price competition.

5. Conclusion

I examine the potential role of advertising in commercial banking, a generally overlooked aspect of bank competition, using data that recently became available for a large sample of U.S. depository

institutions. My findings suggest that advertising is an important tool for non-price competition in the banking industry. Bank advertising per dollar of deposits increases as deposit market concentration increases. Banks with higher market shares, on the other hand, advertise significantly less. There is also evidence that supports scale effects in bank advertising. Accounting for different hypotheses that explain bank profitability and the endogenous nature advertising and market structure variables, I find that advertising has a positive impact on bank profits that is also economically significant. Profitability increases with increases in advertising intensity, after controlling for alternative hypotheses that may explain bank performance. These results suggest that banking research that solely focuses on price competition to assess market structure and bank conduct in the industry may be neglecting an equally important dimension of bank competition. Advertising appears to be an important competitive tool that bank managers rely upon.

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Table 1. Descriptive Statistics

This table provides descriptive statistics for the pooled 2001-2004 sample that is composed of single-market banks that are 9 or more years old. *ADVTD* is advertising intensity defined as advertising expenses divided by total deposits of the bank (in cents per dollars of deposits); *CONC* is the Herfindahl Index of deposit market concentration; *CONSLNSTL* is the ratio of consumer loans to total loans made by the bank; ln*AGE* is the natural logarithm of bank's age; ln*TA* is the bank natural logarithm of bank's total assets (where TA is in millions of constant 2004-dollars); *MKTGROWTH* is the growth of bank's deposit market; *MS* is the deposit market share; *MSA* is an indicator variable that is equal to 1 for metropolitan markets, and 0 otherwise; *RIVALSMARGIN* is the weighted-average interest rate margin of bank's rivals where the weights are rival's market shares; *ROA* is the return on assets ([operating income – operating expenses *excluding* advertising expenses]/TA]; *ROE* is return on equity ([operating income – operating expenses *excluding* advertising expenses]/Total Equity]; *XEFF* is the cost X-efficiency estimate obtained from a stochastic minimum-cost frontier with semi-parametric Fourier terms fitted to all commercial banks in the U.S. (refer to Appendix Table A1 for more details). Financial ratios have been winsorized at 1% and 99% of their distributions.

Variable	N	Mean	Std. Dev.	Min.	Median	Max.
ADVTD (cents per $ of deposits)	8,705	0.0949	0.0801	0.0090	0.0829	1.0519
CONC	16,427	0.2019	0.1447	0.0428	0.1635	1.0000
CONSLNSTL	16,322	0.1220	0.1026	0.0009	0.0937	0.6292
FTEBR	16,420	16.8064	13.2607	4	13.3333	95
lnAGE	16,427	4.117	0.6876	2.1972	4.4188	5.2311
lnMKTBNKS	16,427	2.8430	1.4050	0	2.3979	5.8999
lnMKTDEPS	16,427	7.5228	2.5619	2.2366	6.5352	13.4806
lnTA	16,427	4.4133	1.1193	0.8017	4.3130	12.3922
TA (millions of constant 2004 dollars)	16,427	276.4	3,092.4	2.2	74.7	240,915.2
MKTGROWTH	16,370	0.018	0.0797	–0.2615	0.0190	0.2585
MS	16,427	0.1379	0.1841	0.0001	0.061	1.0000
MSA	16,427	0.4222	0.4939	0	0	1
RIVALSMARGIN	16,073	0.0400	0.0209	0.0001	0.0405	0.1606
ROA	16,427	0.0145	0.0081	–0.0340	0.0148	0.0378
ROE	16,322	0.1431	0.0840	–0.2442	0.1396	0.3990
XEFF	16,062	0.836	0.0819	0.3030	0.8557	0.9838

Table 2. Advertising Intensity Regressions with Instrumental Variables for Market Share

This table presents the 2SLS instrumental variables regression results of equation (1):

$$ADVTD_{i,t} = \beta_0 + \beta_1 MS^{IV}_{i,t} + \beta_2 CONC^{IV}_{i,t} + \beta_3 \left(CONC^{IV}_{i,t}\right)^2 + \beta_4 MSA_m + \beta_5 MKTGROWTH_{i,t}$$
$$+ \beta_6 RIVALSMARGIN_{i,t} + \beta_7 CONSLNSTL_{i,t} + \beta_8 \ln TA_{i,t} + \sum_{j=9,10,11} \beta_j YEAR_t + \varepsilon_{i,t}$$

where, MS^{IV} is the deposit market share instrumented with ln*AGE*, *XEFF* and *MSA*; $CONC^{IV}$ is the Herfindahl Index of market concentration instrumented with the log of the number of banks in the market (ln*MKTBNKS*) and the log of market deposits (ln*MKTDEPS*); *MSA* equals to 1 if bank operates in an urban market, 0 otherwise; *RIVALSMARGIN* is the market share weighted-average of rival banks' margins; *CONSLNSTL* is the ratio of bank's consumer loans to total loans; ln*TA* is the log of bank total assets. **, * and + represent significance at 1%, 5%, and 10%, respectively. *YEAR* dummy coefficient estimates are not reported.

	Full Sample		Full Sample		Urban Banks		Rural Banks	
Constant	0.1151	**	0.0963	**	0.1532	**	0.0859	**
	(8.52)		(6.59)		(4.48)		(6.83)	
MS ^{IV}	–0.3735	**	–0.4031	**	–1.4307	**	–0.1011	**
	(4.43)		(4.59)		(3.49)		(3.85)	
CONC ^{IV}	0.3391	**	0.4772	**	0.6628	**	0.0913	**
	(4.65)		(4.72)		(3.55)		(2.88)	
(CONC ^{IV}) ^{2}			–0.3254	**				
			(2.83)					
MSA	0.0042		0.0011					
	(0.71)		(0.19)					
MKTGROWTH	0.0223	+	0.0212	+	–0.0492	+	0.0421	**
	(1.76)		(1.70)		(1.87)		(3.17)	
RIVALSMARGIN	–0.0964		–0.0385		0.3128		–0.0111	
	(1.38)		(0.53)		(1.21)		(0.16)	
CONSLNSTL	0.0267		0.0285		0.0508		–0.0187	
	(1.21)		(1.29)		(1.18)		(1.34)	
lnTA	–0.0101	**	–0.0079	*	–0.0224	**	–0.0009	
	(3.14)		(2.50)		(3.20)		(0.31)	
Bank-year observations	8,393		8,393		3,593		4,800	
Model F-statistic	8.24	**	7.56	**	2.50	**	3.68	**
RMSE	0.0628		0.0627		0.0773		0.0486	

Table 3. Profitability Regressions with Instrumental Variables for Advertising Intensity

This table presents the 2SLS instrumental variables regression results of equation (2):

$$\pi_{i,t} = \beta_0 + \beta_1 CONC_{i,t} + \beta_2 MS_{i,t} + \beta_3 XEFF_{i,t} + \beta_4 MSA_{m,t} + \beta_5 MKTGROWTH_{m,t} + \beta_6 ADVTD^{IV}_{i,t} + \beta_7 FTEBR_{i,t} + \sum_{j=8,9,10} \beta_j YEAR_t + \varepsilon_{i,t}$$

where, profitability π is measured by *ROA* in Panel A and by *ROE* in Panel B; *CONC* is the Herfindahl Index of deposit-market concentration; *MS* is deposit market share; *XEFF* is the X-efficiency estimate obtained from a stochastic semi-parametric minimum-cost frontier using all commercial banks in the U.S. (refer to Table A1 for more details); *MSA* equals to 1 if bank operates in an urban market, 0 otherwise; *MKTGROWTH* is the growth of real market deposits; and $ADVTD^{IV}$ is advertising intensity (in %) that is instrumented using variables in equation (1). **, * and + represent significance at 1%, 5%, and 10%, respectively. Coefficient estimates for *YEAR* dummy variables are not reported.

PANEL 3A: ROA	**2SLS Regressions with IV for *ADVTD***						**2SLS Regressions with IV for *ADVTD*, *CONC* and *MS***					
Constant	–0.0060	**	–0.0306	**	–0.0431	**	0.0231	*	–0.0396	**	–0.0337	**
	(6.38)		(14.15)		(9.03)		(2.23)		(7.79)		(3.75)	
CONC	–0.0065	**	–0.0033	*	–0.0066	**	0.0250	**	–0.0001		–0.0008	
	(6.28)		(2.33)		(3.27)		(5.01)		(0.02)		(0.22)	
MS	0.0102	**	0.0088	**	0.0156	**	–0.0320	**	0.0036		0.0040	
	(12.24)		(7.67)		(7.96)		(5.33)		(1.06)		(1.26)	
XEFF	0.0217	**	0.0380	**	0.0475	**	–0.0107		0.0487	**	0.0435	**
	(21.35)		(20.99)		(12.86)		(0.93)		(9.68)		(5.30)	
MSA	0.0016	**	–0.0008	*	–0.0007		–0.0021	**	–0.0013	*	–0.0011	+
	(7.63)		(2.40)		(1.58)		(3.44)		(2.30)		(1.73)	
MKTGROWTH	0.0038	**	–0.0002		–0.0012		0.0013		–0.0000		0.0004	
	(3.20)		(0.10)		(0.51)		(0.83)		(0.00)		(0.25)	
ADVTD ^{IV}			0.1240	**	0.2090	**			0.1231	**	0.0965	**
			(14.16)		(8.03)				(9.00)		(2.61)	
FTEBR					–0.0002	**					0.0001	
					(5.49)						(0.76)	
# of observations / banks	8,393		8,393		8,393		8,393		8,393		8,393	
Model F-stat	92.34	**	65.72	**	30.49	**	6.12	**	56.33	**	62.47	**
RMSE	0.0074		0.0102		0.0142		0.0091		0.0102		0.0092	

Table 3. Profitability Regressions with Instrumental Variables for Advertising Intensity (continued)

PANEL 3B: ROE	2SLS Regressions with IV for *ADVTD*						2SLS Regressions with IV for *ADVTD*, *CONC* and *MS*					
Constant	0.8275	**	–0.6776	**	–1.0354	**	–0.0299	**	–0.3734	**	–0.5982	**
	(5.10)		(9.61)		(4.65)		(2.98)		(13.80)		(8.60)	
CONC	0.4345	**	0.0793		0.1206		–0.0984	**	–0.0550	**	–0.1141	**
	(5.55)		(1.56)		(1.42)		(8.93)		(3.07)		(3.89)	
MS	–0.6748	**	–0.0743		–0.0935		0.1195	**	0.1005	**	0.2234	**
	(7.18)		(1.55)		(1.20)		(13.45)		(7.02)		(7.85)	
XEFF	–0.7682	**	0.7403	**	1.0569	**	0.1813	**	0.4073	**	0.5794	**
	(4.26)		(10.62)		(5.19)		(16.64)		(18.02)		(10.77)	
MSA	–0.0434	**	–0.0186	*	–0.0341	*	0.0344	**	0.0014		0.0027	
	(4.48)		(2.34)		(2.23)		(15.51)		(0.33)		(0.41)	
MKTGROWTH	0.0196		0.0135		–0.0115		0.0746	**	0.0188		0.0003	
	(0.81)		(0.56)		(0.28)		(5.80)		(0.90)		(0.01)	
ADVTD ^{IV}			1.9478	**	3.5613	**			1.7258	**	3.2587	**
			(10.28)		(3.88)				(15.79)		(8.60)	
FTEBR					–0.0039	+					–0.0043	**
					(1.87)						(6.83)	
Bank-year observations	8,393		8,393		8,393		8,393		8,393		8,393	
Model F-stat	16.57	**	56.13	**	19.78	**	98.93	**	61.84	**	20.53	**
RMSE	0.1424		0.1412		0.2276		0.0793		0.1272		0.2064	

Appendix Table A1. Cost X-Efficiency Estimation

X-efficiency estimates are obtained from the estimates of the following stochastic minimum-cost frontier for the population of banks in each year:

$$\ln\left(\frac{C}{w_3 z_2}\right) = \alpha + \sum_{i=1}^{2}\beta_i \ln\left(\frac{w_i}{w_3}\right) + \frac{1}{2}\sum_{i=1}^{2}\sum_{j=1}^{2}\beta_{ij} \ln\left(\frac{w_i}{w_3}\right)\ln\left(\frac{w_j}{w_3}\right) + \sum_{m=1}^{2}\chi_m \ln\left(\frac{y_m}{z_2}\right) + \frac{1}{2}\sum_{m=1}^{2}\sum_{n=1}^{2}\chi_{mn} \ln\left(\frac{y_m}{z_2}\right)\ln\left(\frac{y_n}{z_2}\right)$$
$$+ \delta_1 \ln\left(\frac{z_1}{z_2}\right) + \frac{1}{2}\delta_{11} \ln\left(\frac{z_1}{z_2}\right)^2 + \sum_{i=1}^{2}\sum_{j=1}^{2}\gamma_{im} \ln\left(\frac{w_i}{w_3}\right)\ln\left(\frac{y_m}{z_2}\right) + \sum_{i=1}^{2}\mu_i \ln\left(\frac{w_i}{w_3}\right)\ln\left(\frac{z_1}{z_2}\right) + \sum_{m=1}^{2}\theta_m \ln\left(\frac{y_m}{z_2}\right)\ln\left(\frac{z_1}{z_2}\right)$$
$$+ \sum_{q=1}^{5}\left[\theta_q \cos(\Psi_q) + \rho_q \sin(\Psi_q)\right] + \sum_{q=1}^{5}\sum_{r=1}^{5}\left[\theta_{qr} \cos(\Psi_q + \Psi_r) + \rho_{qr} \sin(\Psi_q + \Psi_r)\right] + u^C + v^C$$

where, C is the adjusted-total bank costs (including interest and non-interest expenses but <u>*excluding*</u> "other non-interest expenses" which includes advertising expenses and is reported by all banks); w_1 is the price of labor; w_2 is the price of small (core) deposits; w_3 is the price of purchased funds (wholesale CDs, fed funds, repos, demand and subordinated notes); y_1 is the level of first output - securities; y_2 is the level of second output - loans and leases; z_1 is the level of the first netput - physical capital; z_2 is the level of the second netput - financial (equity) capital; and $cos(\Psi_q)$ and $sin(\Psi_q)$ are orthogonal trigonometric Fourier terms that are created based on rescaled cost function explanatory terms spanning the [0.1×2π, 0.9×2π] range using the following transformation: Ψ_q=0.2π-μ×Min(φ)+μ×φ and μ=(0.9×2π-0.1×2π)/[Max(φ)-Min(φ)]. Costs are scaled by one of the input prices to insure factor price homogeneity, and by one of the fixed-netputs to avoid heteroskedastic joint-error terms. For more details, refer to Berger and Mester (1997). Cost X-efficiency is obtained from the decomposition of the composite error term estimate: $E[u_i^C \mid \varepsilon_i^C] = \frac{\sigma_u \sigma_v}{\sigma}\left[\phi\left(\frac{\varepsilon_i^C \lambda}{\sigma}\right) \Big/ \Phi\left(\frac{\varepsilon_i^C \lambda}{\sigma}\right) + \frac{\varepsilon_i^C \lambda}{\sigma}\right]$ where, $\sigma = \sqrt{\sigma_u^2 + \sigma_v^2}$, $\lambda = \frac{\sigma_u}{\sigma_v}$; and $\phi(.)$ and $\Phi(.)$ are the normal and the cumulative normal distributions, respectively.

The obtained X-efficiency estimates (*XEFF*) have the following distribution over 2001-2004:

Year	N	Mean	Std. Dev.	Min.	Median	Max.
2001	7,710	0.8681	0.0639	0.2001	0.8815	0.9893
2002	7,499	0.8321	0.0827	0.1548	0.8502	0.9830
2003	7,390	0.8244	0.0826	0.1951	0.8421	0.9803
2004	7,256	0.8172	0.0842	0.1681	0.8346	0.9751

Appendix Table A2. Advertising Intensity Regressions with Instrumental Variables for Market Share and Selection Bias Correction with Heckman's Model

			Heckman Model				
Advertising Intensity Model	**IV Regression**		**IV Regression**		**Selection Model**		
Constant	0.0963	**	0.1141	**	***Constant***	0.0375	
	(6.59)		(12.62)			(0.41)	
MS ^{IV}	–0.4031	**	–0.3589	**	Interest Income/TA	–0.0369	*
	(4.59)		(12.41)			(2.36)	
CONC ^{IV}	0.4772	**	0.4270	**	Interest Expenses/TA	–0.0184	
	(4.72)		(10.81)			(0.98)	
(CONC ^{IV}***)***^{2}	–0.3254	**	–0.2628	**	Non-Interest Income/TA	–0.0138	
	(2.83)		(3.77)			(0.63)	
MSA	0.0011		0.0042		Labor & Physical Capital Expenses/TA	0.0470	*
	(0.19)		(1.30)			(2.23)	
MKTGROWTH	0.0212	+	0.0309	**	Other Non-Interest Expenses/TA	0.3806	**
	(1.70)		(2.92)			(11.83)	
RIVALSMARGIN	–0.0385		–0.0342		lnTA	0.0057	
	(0.53)		(0.69)			(0.48)	
CONSLNSTL	0.0285		0.0259	**	MKTGROWTH	–0.5536	**
	(1.29)		(3.30)			(4.24)	
ln*TA*	–0.0079	*	–0.0068	**	CONC	–0.6745	**
	(2.50)		(3.95)			(7.79)	
					MSA	–0.1371	**
						(4.93)	
Bank-year observations	8,393		8,393			16,083	
Model Significance (F / χ^2)	9.53	**				437.46	**
					λ	–0.0289	**
					ρ	–0.4338	
					H_0: ρ=0	67.80	**