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Structure and Performance: Some Evidence from California Banking

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The "Structure-Performance Hypothesis" has been the subject of controversy for 35 years. One aspect of this controversy is the difficulty of measuring the economic performance of firms. In this paper, data on the rate of bank entry in California banking markets is used in a new, indirect test of the hypothesis. The results are consistent with the idea that increased concentration is associated with increasingly high profits.

Anti-trust policy toward the banking industry rests partly upon the premise that increased concentration of market share causes a deterioration in the performance of banking firms. As concentration increases in a market, according to the premise, so too does stable, anti-competitive conduct (such as overt or tacit collusion). Known in the industrial organization literature as the structure-performance hypothesis, this premise has been debated hotly for over thirty years on both theoretical and empirical grounds.

This paper re-examines empirically the link between structure and performance by indirectly using data from California banking markets. In particular, we study the relationship between the structure of California banking markets and the rate of bank entry. Although entry is not *per se* a performance measure, its study provides some insight into the relationship between structure and performance without many of the conceptual and measurement problems encountered in using direct performance measures such as profits and prices.

Our results are consistent with the contention that increased concentration is associated with increasingly high profits. In addition, we find that at any given level of concentration, entry rates are higher in markets with a large number of suppliers. This latter finding is consistent with the notion that entry-limiting pricing discipline is difficult to sustain when the number of producers becomes large. These findings, thus, reinforce the arguments that support anti-trust policy. As we discuss below, however, such evidence of a structure-performance link is only one step in the logic that supports a policy of active manipulation of market structure to improve market efficiency.

The remainder of the paper is organized as follows. First, we discuss the origins of the formal structure-performance hypothesis and the various theoretical and empirical criticisms of its study and use in anti-trust policy. Second, we discuss the rationale of structure-entry tests as an alternative to conventional structure-performance studies. After discussing the data and empirical findings, the paper concludes with a summary of the findings and their policy implications.

I. The Structure-Performance Relationship

The notion that market structure influences performance originates from observations about the theory of the firm. In a world characterized by pure and perfect competition, for example, theory argues that firms in the marketplace will perform in a socially desirable fashion, producing where price

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equals marginal cost and enjoying only "normal" profits. One of the attributes of the perfect competition model is that production is performed by many firms, each too small to influence market prices. Thus, in the classic model of competition, low concentration of market share is associated with socially desirable performance.

In contrast, under circumstances of pure monopoly — where there is, by definition, only one producer and, thus, complete concentration of market share — socially undesirable performance results. Under such performance, price exceeds marginal cost and leads to sub-optimal production and "excess" profits. In this case, concentration of market share is associated with undesirable performance.

Understandably, the implications of these two special models of the firm — perfect competition and pure monopoly — spawned the notion that markets displaying an intermediate level of concentration might, therefore, perform in a manner between these extremes. Since most markets are not characterized by the features of the simple perfect competition or monopoly models, such a notion is of practical interest. Economic theory, however, does not articulate clearly the association between concentration of market share and performance in imperfectly competitive models.

The notion that a monotonic relationship might exist between market share concentration and performance is thus a purely empirical one. It was first advanced by the economist Joe S. Bain in the late 1940s.[2] He hypothesized that the ability of firms to engage in overt or covert collusive behavior increases as the concentration of market share increases. In the process, the likelihood that the firms would display anti-competitive or quasi-monopolistic performance also rises. Bain first tested this hypothesis in 1951 using reported profits of the firm as a measure of performance.[3] He found that increased concentration, indeed, was associated with higher profit rates and this result started the structure-performance controversy.

Criticisms of Structure-Performance Studies

Structure-performance studies are controversial for a number of reasons. First, discovering an association between market concentration and performance does not establish market concentration as the *cause* of the observed performance and, thus, does not by itself provide a rational basis for a policy of manipulating market structure to improve performance.

It has been argued, for example, that the higher profits observed to be enjoyed by large firms in concentrated markets are the result of economies of scale and the consequent superior efficiency of large firms. This claim seems particularly relevant in the context of the early structure-performance studies, which examined a cross-section of industries displaying different market share concentration levels. The firms in such a sample undoubtedly faced different technological and demand conditions that had the potential of systematically affecting a performance measure such as profit, as well as a structural characteristic such as market share concentration.[4]

For studies *within* an industry, such as the numerous structure-performance studies of the banking industry, this particular criticism is less likely to be relevant. The possibility remains, however, that a third factor positively related to both concentration and price or profit performance measures statistically links concentration and performance, giving the appearance of a direct, casual link when none exists.[5]

A second major criticism of structure-performance studies is that the structure-performance notion hypothesizes a relationship between structure and inefficient firm behavior but most studies have used performance measures that may not unambiguously detect such inefficiency. The use of published data on profits to proxy true economic profits, for example, is notoriously flawed. In an industry such as banking, where accounting relies heavily on book valuation of assets and liabilities, reported net income flows, rates of return on assets, and net worth are of dubious empirical usefulness. Moreover, expense-preference theory suggests that firms enjoying market power may express inefficiency by indulging in objectives other than maximizing shareholder profit. Such behavior would argue against finding a consistent relationship between structure and measured profits.[6]

Similar criticisms have been leveled against the

use of price as a performance variable. In most industries, including banking, the products offered by firms are not homogeneous, but rather vary in quality, attendant service characteristics and other attributes. In banking, for example, the proximity of branching facilities, availability of automated teller machine services, and many other service attributes are relative dimensions of the "price" of deposit or loan services (indeed, prior to the elimination of deposit rate regulation, this was the *only* dimension of competition for certain types of bank liabilities.) If the non-price attributes of bank products vary systematically with concentration because of their mutual association with a third factor, spurious relationships between concentration and price performance may appear when none exist, or no relationship may be observed when one, in fact, does exist.

Finally, structure-performance studies have been criticized because of the difficulty in properly defining the relevant variables and controlling for other possible influences.[7] Defining an appropriate "market" and identifying its constituent producers, for example, certainly involves some arbitrariness. Similarly, alternative measures of concentration exist[8] with little theory to guide choosing among them. These criticisms strike this author as somewhat nihilistic and properly could be directed at virtually all empirical work.

Entry and Market Structure

Almost all of the more than 200 structure-performance studies of the banking industry have employed profit or price measures of performance.[8] Because of the potential problems of systematic bias pointed out above, it is worth considering alternative means of identifying inefficient performance. In this paper, we examine the relationship between rates of new entry and market share concentration. Although the logic of this relationship is itself not unassailable, entry can be measured more accurately than other factors required of direct structure-performance studies.

We thus will be focusing on the relationship between entry activity and concentration. The logic of the test is fairly straightforward. If market share concentration allows incumbent firms to enjoy abnormally high profits, new entry into the affected marketplace would be expected. Indeed, at least in simple formulations of industry behavior, it is entry that is expected to bring discipline to the marketplace and to ensure that production is expanded to the point where price equals marginal cost. For this concept to be useful in examining the notion of a link between structure and performance, however, certain other assumptions and qualifications must be made.

First, it must be assumed that new entrants cannot be mobilized instantaneously. If this were the case, market structure could be altered instantaneously and one would not observe variations in market structure of any importance in markets that were otherwise identical. Thus, no relationship between market structure and entry rates would be observable.[9] Finding a positive relationship between market concentration and entry does not, however, identify for us the process that permits high levels of concentration to be maintained. We can, however, structure the model to test for the simple possibility that concentration persists because of lagged adjustment. In particular, we define

$$E^*(t) = E^*(X(t)),$$

where $E^*(t)$ is the desired rate of entry if such entry could be effected immediately in period t, and $X(t)$ is a vector of variables influencing that rate.

The response of actual entry $E(t)$ to $X(t)$ is likely to be influenced by the regulatory time lags and general adjustment costs that confront a new entrant. Thus the actual rate of entry in any given period is likely to depend upon the past pattern of entry in addition to variables influencing the "desired" or target rate of entry, $E^*(t)$. The actual entry relationship therefore might be written as

$$E(t) = E(X(t), E(t-1), E(t-2), E(t-3)\ldots).$$

Because of data limitations, we are unable to examine such a generalized model for the adjustment of $E(t)$ to conditions in previous periods. Our studies employ only $E(t-1)$ to model the influence of previous economic states on current entry. Inclusion of a lagged dependent variable in a regression equation also may serve to proxy for the influence of variables omitted from the arguments of the equation.

Second, although finding a positive relationship between concentration and entry in such a model would be consistent with the notion that concentra-

tion is associated with excess profits, a converse finding offers no information. The absence of a relationship between concentration and entry could arise because the incumbent firms in a concentrated market, although they enjoy excessive profits, are able to erect impenetrable barriers to entry. Alternatively, the firms that constitute the concentrated market may be especially efficient and, although they enjoy excess profits, able to maintain price at or below the level needed to support an entrant of average efficiency.[10] Unfortunately, therefore, the absence of an observed relationship between concentration and entry does not necessarily disprove the existence of a relationship between concentration and profits.

Finally, it should be emphasized that finding a positive relationship between market share concentration and entry need not imply that active intervention to deconcentrate market structure will improve efficiency. Improving efficiency would require an ability to define optimal entry from the standpoint of economic efficiency — something that cannot be done by this, or probably any, structure-performance study. Whether entry is sub- or supra-optimal has been argued to depend upon specific demand and cost characteristics.[11]

In summary, excess profits should induce net entry into a banking market. To the extent that market structural factors are related to profit rates, therefore, entry and market structure may be associated. No association will be observed, however, if the market is in entry equilibrium at all times, that is, when excess profits are extinguished immediately by the influence of actual or threatened entry.

The Determinants of Entry

The simple theory of the firm provides the argument that excess profits observed within an industry may induce the net entry of new firms into a marketplace.[12] However, the presence or absence of excess profits may not be the only factor influencing entry. We turn here to a discussion of two possibly moderating influences on entry: growth in demand (that is, the "scale" of the market) and entry barriers.

Growth in demand or in the scale of a marketplace may or may not result in net new entry. If cost conditions are such that the optimal size of a firm in the marketplace is indeterminate (such as under conditions of constant returns to scale) or favors large-scale firms (in an environment of increasing returns to scale), then current firms may meet the amplified demand for industry output by expanding their scale of production. If, on the other hand, increased firm scale is associated with decreased returns, growth in demand may be associated positively with the rate of net new entry. In the studies of entry rates reported below, various demographic and economic scalars are employed to isolate this effect.

A second factor influencing entry behavior is itself a market structure characteristic, namely, entry conditions. The ease or cost of entry can be influenced by numerous factors, including bank charter regulations and land use procedures affecting the location of commercial activity. To the extent such factors dominate the entry decision process, they will also obscure any observation of the hypothesized link between concentration and profits and profits and entry.

Similarly, market share concentration may be associated not only with the enjoyment of abnormal profits, but also with efforts by incumbent firms to accumulate power for the purpose of retarding new entry. A common proposition along these lines is that the existence of economies of scale not only predisposes a market to display a concentrated structure, but also confers on incumbent firms the ability to retard entry.[13] It is not necessary to replay the debate here, but it is worth noting that if entry conditions do deteriorate as concentration increases, this condition also would tend to bias studies toward the finding that concentration has no effect on profits and entry.

One of the inherent propositions in the structure-performance hypothesis, however, is that non-atomistic market structures may permit covert or overt coordinated pricing behavior that has the effect of limiting entry. To the extent that entry limit pricing (or other conduct that retards entry) is facilitated by the lack of numerous rivals, entry rates at any given level of industry profit should be higher in markets with a greater number of existing rivals. Thus, in addition to anticipating a positive relationship between concentration and entry, a positive relationship between the number of institutions in a market and the rate of entry also should be anticipated.

Finally, structure-performance studies using *price* as the performance measure often are criticized (probably fairly) for ignoring differences in the qualitative aspects of the products offered by different-sized firms and firms in different markets. The advantage of studying the effect of structure on entry rather than prices is that we need worry less about variation in service quality as long as all firms in the market *potentially* can offer the same product or service quality. Thus, for testing the hypothesis that high market share concentration may result in abnormal profits that attract entry, it makes little difference if the actual mix of products or quality of service varies within the sample.

II. California Banking Markets

The basic unit of observation in our study is a banking market. We focused on activity in California banking and constructed measures of the rate of entry of banking institutions and variables describing the structural and demographic characteristics of the banking markets in the state.

Before proceeding to a more detailed description of the data employed, it is worthwhile to review the rationale for focusing on the California market and the issues that arise in defining the variables. California banking operates in an environment particularly conducive to exploring the concentration-entry hypothesis. First, as mentioned above, California has long had a policy of unlimited, intrastate branching, and state banking policy has permitted vigorous entry. In 1970, there were 203 commercial banks; by 1980, this number had increased to 311.[14] California's economic geography also provides the variation in economic conditions and bank structure necessary to test the structure-entry hypothesis. Indeed, the study of California banking is, in terms of sheer scale of banking activity, analogous to studying the banking system of a medium-sized western country. (California is very similar to Canada, for example, in population and growth levels of economic activity.)

Finally, the thrift industry in California — which must at least be considered a potential rival to the commercial banking industry — is relatively homogeneous. It consists almost entirely of savings and loan associations, with no mutual savings banks and few thrift and loan companies.

California, although an extremely large economy, abuts rural, desert or mountain areas, ocean or the country of Mexico. Thus, we need worry less about border competition effects and interstate differences in regulatory policy on banking in California than in other important banking markets such as New York and Pennsylvania, which are adjacent to still other important banking markets.

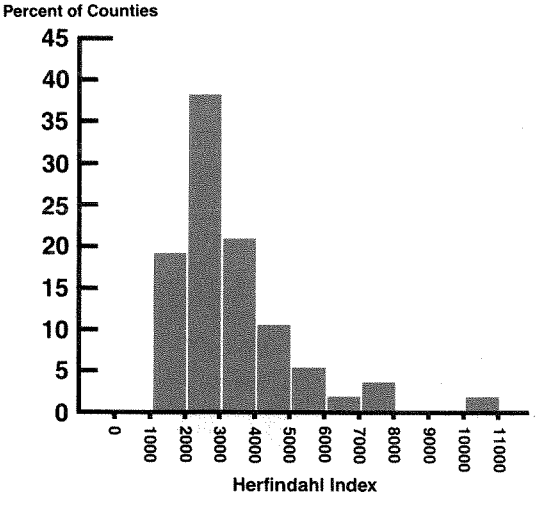
The banking industry in California is considerably concentrated in all reasonable market geographies. In 1974, for example, the Herfindahl Index at the state level was over 2500 within commercial banking.[15] The deposit market share of the four largest banks in California has hovered near 60 percent throughout the study period.

Banking also is concentrated at the local market level. The Herfindahl Index within California counties has exceeded 2,000 throughout the study period. The United States Department of Justice presently considers any Herfindahl Index in excess of 1,800 to signify a concentrated market.

Chart 1 presents additional detail concerning the distribution of concentration in commercial banking in California counties.

Chart 1

Market Concentration in California Counties, 1980



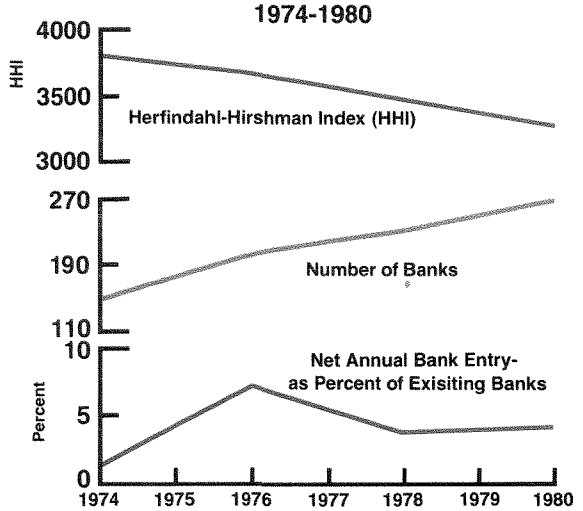
Defining Banking Markets

The preceding statistics on the geographic concentration of banking activity in California raise the important issue of how to define the appropriate market geography for this study. Such definition has been widely debated both among economists and among regulators and the judiciary.[16] From a banking structure standpoint, the market geography should be defined in such a way that the aggregate of economic forces impinging upon the banks within that geography dominate the forces exerted upon them by institutions outside that geography. This, in turn, clearly depends upon the accessibility of various products to consumers, which, in turn, determines the extent to which the products offered by various institutions are close substitutes. Various investigators therefore have used market areas defined on the basis of commute patterns, shopping patterns, residential densities, and even proposed complex lexicographic schemes.[17]

In this paper, our choice of market definition is a practical one compelled by the availability of economic and demographic data necessary to test for the effects of growth in market scale as discussed above. In particular, we must employ counties (or aggregates of counties). We do not deny the arbitrariness of this definition, but hasten to point out that California — like many states — implements land use regulation through county general plans. There may be, therefore, fortuitous relationships between the county geography and the geography implied by employment, commute or residential land use patterns. Indeed, as arbitrary as the political subdivision may be in defining banking markets, it has survived structure-performance studies that compared it to alternatives.[18]

Our approach resulted in the definition of 58 markets in California, although our markets are large relative to the geographic market definitions employed by investigators in Eastern states. Minor variations on the county market definition were explored, such as employing SMSA definitions in metropolitan areas and eliminating extremely large counties such as San Bernardino County from the sample in alternative regressions. Since these variations did not yield important differences in the findings, the following discussion is based only on the use of county measures of market areas.

Chart 2
Measures of Selected Variables for California, 1974-1980



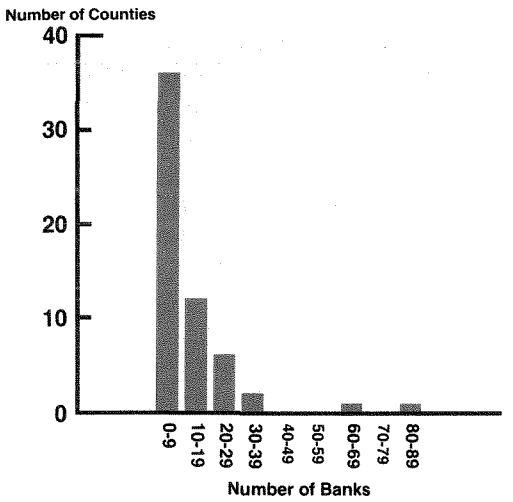
Trends in Entry and Concentration

As Chart 2 shows, there has been vigorous entry by new institutions in California county banking markets throughout the study period and, consistent with this, there has been a secular decline in concentration as well. In the third panel of Chart 2, the entry rate — defined as the net number of new institutions entering a county market over a two-year period divided by the number of institutions in the base year — is graphed. As the graph indicates, the rate of net new entry of institutions has fluctuated between slightly above 1 percent to over 7 percent on an annualized basis over the study period. Because of this significant variation, it was important to test the hypothesis using a series of cross-sections to ascertain the stability of the relationship, if any, between concentration and entry rates.

Chart 3 depicts the distribution of banking institutions among counties. Most of the counties (over 35) have 9 or fewer banking institutions. Conversely, only about a dozen counties have 20 or more institutions in them. To the extent that the number of institutions in a marketplace may affect

Chart 3

Distribution of Number of Banks in County, 1980



competition independent of the Herfindahl measure of concentration, it is important to note the wide disparity in bank populations by county. We address this issue in the empirical work below.

Trends in Bank Size

There also is wide variation in the rates of growth of individual banks within the state between 1972 and 1980. The average annual rates of growth for banks that were in the sample in 1972 and remained in the sample in 1980 was highly variable. Moreover, the growth rates bore no statistical relation to bank size (measured in this context by total deposits).[21] This finding, interestingly, is consistent with Gibrat's stochastic model of market share concentration. Gibrat argued that if rates of growth of firms in a marketplace were distributed randomly (independent of firm size), this stochastic process alone would be sufficient to generate a non-uniform distribution of market share among firms much like the pattern observed in most marketplaces. Namely, most of the market would be served by a few large firms, but many small firms would coexist.[22]

If Gibrat's hypothesis explains the market share concentration observed in California banking markets, the interpretation of our study of concentration and entry rates may be less ambiguous since Gibrat's hypothesis militates against the argument that economies of scale or permanent differences in the efficiency of individual firms explain the market share supremacy of certain firms over others. Thus, if we find a positive relationship between concentration and entry, it suggests that concentration *per se* affords incumbent firms some protection from profit-extinguishing competitive behavior.

III. Empirical Tests of the Relationship Between Entry and Concentration

We turn now to our empirical examination of the relationship between entry and market share concentration. Data from the period 1972 to 1980 were used to construct the variables employed in the studies reported here. The statistics on banking activity and market demography were available only for the years 1972, 1974, 1976, 1978 and 1980. (We chose not to expand the study into the 1980s to avoid the influence of the major changes in state and federal banking regulation that occurred at that time.) Because of the complexity involved in constructing some of the measures employed here, we digress momentarily to describe the construction of dependent and independent variables.

Constructing The Variables

We measured entry by observing flows of institutions, branches and other measures of capacity in and out of various geographic banking markets. The entry rates were measured using two-year measurement intervals. Thus, from 1972 to 1980, we obtained four two-year cross-sections of entry observations. Since the basic form of the estimated relationship is that presented in the preceding section, a lagged entry rate variable was one of the arguments of the regression leaving us with three cross-sections to study.

Our main interest is in the notion of *new entry*, that is, the entry of banking firms into banking

markets in which they were previously not represented. We are also interested, however, in the possibility that high levels of concentration may induce existing firms to expand their presence in the marketplace, net of any withdrawal from the marketplace that may occur. The *branch growth rate* was used to study this entry process. Finally, we wish to study the extent to which entry is a phenomenon of existing banks or new banks. We therefore examined the *de novo branch growth* and *de novo bank entry rate* as additional measures of entry activity.

In all cases, the entry rate was defined as the change in the entry measure occurring over a two-year period divided by the level of that measure at the beginning of the two-year period. Therefore, in some of the entry measures studied, we distinguished between a *gross* rate of entry, an *exit* rate and a *net rate* of entry. The gross rate was computed by counting all entry events over each two-year time frame as a percentage of the level in the base of the two-year period. The *exit rate* was a count of all exit events as a percentage of the level of the measure in the base of the two-year period, and the *net entry rate* was constructed as the net of entry events over exit events divided by the level's measure in the base of the period.

The independent variables in the regression, if they are level variables, are the measures relevant to the base year of the entry measure. Those independent variables that are *rate variables* (such as population and income growth) are the rates that occurred in the two-year period just prior to the base date of the entry measure. In this way, the independent variables may be viewed as measures that are truly not contemporaneous with the entry activity they are seeking to explain.

In addition to the lagged dependent variable, the independent variables consist of the Herfindahl index and the number of branches and/or institutions as measures of the structural characteristics of the banking market. The rate of growth of per capita income and the rate of growth of population were included as scalars of market demand.

Numerous variations on these three basic entry notions also may provide insight into the processes that stimulate entry into California banking markets. We examine, for example, the exit of existing firms to see if the process of elimination of banking firms is in any way related to market share concentration or the other demographic or structural variables. Most exit in the banking industry occurs through merger, either voluntary or arranged, for failing banking firms by bank regulators. The exit concept that can be developed from available data, therefore, differs somewhat from the exit concept in the economic literature, which refers to the departure of productive capacity from the marketplace altogether.

New Bank Entry

Table 1 presents regression results from a pooled time series of cross-sections used to analyze the effects of concentration and the other independent variables on new entry.[23] Concentration and the rate of new entry appear to be positively related in the sample. The size of the coefficient indicates that an increase in the Herfindahl Index by 50 would result in an increase in the 2-year rate of entry of 2 percent. (This is an elasticity of approximately 0.6 at the sample means.)[24] New entry also is positively related to population and personal income growth in the county markets, although with marginal significance.[25]

The number of institutions already in the market appears to have a significant, positive effect on entry. This finding is consistent with the notion that entry limit pricing discipline may be more difficult to maintain in a market in which there are many potential rivals. Alternatively, the positive association between the number of institutions and the rate of entry may be the result of differences in the minimum efficient scale in markets of different capacity. It may be easier, for example, for a bank to enter a market with the capacity to support a large number of banks than a market that can support only a few banking facilities of an efficient size. Attempts to verify this hypothesis, however, were unsuccessful.[26]

Finally, it should be noted that the coefficient on the lagged value of entry variable is small and of marginal statistical significance. This does not necessarily imply that past entry rates do not influence current rates given the simplicity of the lagged structure permitted us by the data. The fairly consistent negative sign on this variable may indicate that

stochastically high or low rates of entry in a given time period may, respectively, discourage or encourage entry activity in the two years following. This could be the consequence of information lags, the reaction of incumbent firms or simply misspecification of the model. In addition, the lagged variable may be a proxy for some omitted, contemporaneous influence on entry.[27]

Table 1 also presents the results of studies of the *exit rate* and the *net bank entry rate* using a regression model of the same structure containing the same variables. Analysis of our sample indicates that most banking firms "exited" the market through merger with surviving institutions. Most of the coefficients in the exit regression are not statistically significant. However, the significant, positive association of exit with population growth suggests that incumbent firms respond at least partly to the growth in the scale of the market by acquiring existing banking capacity. The *net bank entry* rate regression reinforces the notion, however, that new entry is responding not so much to growth to market scale as to the level of concentration in the market.

De Novo Entry and Concentration

In the preceding reported results, we studied the effects of a market's concentration on the entry of banking firms not previously serving that market. In Table 2, we focus our activity on true *de novo* bank entry by studying the effects of concentration on the rate at which new banking firms are created. It is important to make this distinction in the event that regulatory barriers to entry — which are presumably more important for *de novo* banks than for new branch facilities — are an important determinant of entry patterns.

As Table 2 indicates, however, the pattern of the relationship between *de novo* entry rates and concentration is similar to that observed between concentration and all forms of entry into the county market. In our sample, the entry of *de novo* banks explains about one-third of the total entry rate over our study period; most of the new entry into county markets was due to the geographic expansion of existing banks. Nevertheless, it appears that the market structure variables have an influence on *de novo* entry that is qualitatively similar in direction and magnitude to that observed for geographically expanding institutions.[28]

Branch Entry and Concentration

By analyzing entry only in terms of entry of banking institutions, we may be under- or overstating the responsiveness of entry to changes in

TABLE 1
Studies of Bank Entry

	Rate of Bank Entry	Rate of Bank Exit	Net Rate of Bank Entry
Lagged dependent variable	−0.12 (1.4)	−0.13 (1.5)	−0.13 (1.7)
Herfindahl Index	1.8×10^{-5} (3.2)	3.3×10^{-6} (1.2)	1.5×10^{-5} (2.9)
Personal Income Growth	0.03 (1.6)	0.01 (0.92)	0.02 (1.2)
Population Growth	0.55 (1.8)	0.26 (1.8)	0.31 (1.1)
Number of Institutions	4.1×10^{-3} (3.7)	2.0×10^{-3} (4.0)	2.1×10^{-3} (2.2)
R^2	0.39	0.26	0.26
n	174	174	174

Note: Numbers in brackets are t-ratios.

concentration if the entering institutions are larger or smaller, respectively, than existing banking firms. In addition, we may be failing to measure increases in total banking capacity that are occurring because of the growth of incumbent banking institutions in a given market.

We examine this possibility in Table 3 through three different measures of changes in banking capacity. The first two regressions examine the branch growth pattern of incumbents as well as out-of-county banks before and after correction for closures and consolidation of branches. The effect of concentration on this measure, once again, is qualitatively similar to that found in all other entry measures. Branches may not, however, accurately measure the true increments to banking service capacity created by new entry or branching activity. Ideally, we would like to know the design capacity of the new facilities to study capacity increments directly. In the absence of this data, we are able only to look at the actual activity attracted to the new facilities. In the third regression presented in Table 3, the rate of deposit growth represented by new branches (of either *de novo* or incumbent banks) is employed as a dependent variable. Once again, we observe a positive relationship between concentration and subsequent entry.

IV. Summary and Conclusions

The vigorous growth in the number of banks and branches in California in the 1970s has provided an opportunity to test the simple notion that new entrants will be attracted to markets with high concentration because high concentration is, according to the structure-performance hypothesis, associated with abnormally high profits. We, indeed, have observed a positive relationship between entry and the ambient level of concentration in the market, a finding that is consistent with, but not necessarily proof of, the notion that concentration and profit rates are positively correlated.[29] In addition, the rate of entry is enhanced, rather than retarded, by the presence of a large number of banking institutions. This finding is consistent with the argument that firms in a concentrated market not only enjoy higher profits, but are able to pursue entry-limiting pricing strategies more

TABLE 2
Studies of *De Novo* Bank Entry

	Rate of *De Novo* Bank Entry	Rate of *De Novo* Bank Exit	Net Rate of *De Novo* Bank Entry
Lagged dependent variable	−0.17 (2.0)	−0.15 (1.4)	−0.11 (1.5)
Herfindahl Index	1.6×10^{-5} (3.7)	3.9×10^{-6} (1.4)	1.2×10^{-5} (3.3)
Personal Income Growth	-8.3×10^{-4} (0.07)	-1.4×10^{-3} (0.16)	5.8×10^{-4} (0.05)
Population Growth	0.3 (1.3)	0.22 (1.4)	0.05 (0.25)
Number of Institutions	1.9×10^{-3} (0.84)	2.1×10^{-3} (1.4)	-2.5×10^{-4} (0.13)
Number of Branches	-1.1×10^{-4} (0.57)	-1.2×10^{-4} (0.94)	1.8×10^{-5} (0.11)
R^2	0.28	0.15	0.15
n	174	174	174

easily than in a market where there are few rivals of any size.

Although our findings provide support for those who believe structure influences performance, we are unable to extend the implications of our study to any particular prescription regarding anti-trust policy. We do not observe efficiency directly in structure-performance studies and thus are not in a position to conclude that the manipulation of market structure will necessarily make a market more efficient. Conversely, although it is tempting to interpret the findings as evidence that entry can be relied upon to repair inefficiently structured markets, we have no way of evaluating whether the observed levels of entry are sub- or supra-optimal in the sense of *dynamic* efficiency. Anti-trust policymakers by necessity must bring their own judgment to bear on evaluating such evidence until a time when theory and empirical evidence can be more helpful.

TABLE 3
Studies of Alternative Entry Measures

	Total Branch Growth Rate	Net Total Branch Growth Rate	Deposit Entry
Lagged dependent variable	−0.05 (0.69)	0.02 (0.23)	−0.14 (1.6)
Herfindahl Index	1.6×10^{-5} (3.6)	1.2×10^{-5} (2.9)	4.5×10^{-6} (2.3)
Personal Income Growth	-2.5×10^{-4} (0.02)	-8.3×10^{-4} (0.07)	-6.1×10^{-4} (0.1)
Population Growth	0.42 (1.7)	0.21 (0.99)	0.2 (1.8)
Number of Institutions	7.0×10^{-3} (2.9)	4.3×10^{-3} (2.0)	7.0×10^{-4} (2.0)
Number of Branches	-4.3×10^{-4} (2.1)	-2.7×10^{-4} (1.5)	n.a.
R^2	0.43	0.21	0.27
n	174	174	174

FOOTNOTES

1. The model of perfect competition assumes that a market is characterized by unrestricted entry and exit, the absence of scale economies, homogeneous products and perfect information in addition to atomistic production.

2. Joe S. Bain, "Workable Competition In Oligopoly," *Economic Review,* May 1950, pp. 35-47.

3. Joe S. Bain, "Relation of Profit Rate To Industry Concentration: American Manufacturing, 1936 to 1940," *Quarterly Journal of Economics,* August 1951, pp. 293-324.

4. Bain knew the hazards of testing the hypothesis in this manner and pointed out that an observed structure-performance relationship was of interest only if entry, technological and demand conditions were the same across the sample and uncorrelated with market share concentration (see Bain, 1951).

5. Demsetz (1973) argued that some studies finding a positive relationship between market share concentration and profits actually showed a relationship between *large* banking firms and profitability and that the expected higher returns by smaller firms were not found. His results, like those of most concentration-profit studies, however, were not particularly consistent and may suffer from some of the problems pointed out later in this paper.

6. Franklin R. Edwards, "Managerial Objectives in Regulated Industries," *Journal of Political Economy* February 1977, pages 147-162.

7. For a survey of the various criticisms of structure-performance models in banking, see D. Osborne and J. Wendell, "Research on Structure, Conduct and Performance in Banking: 1964-79," Oklahoma State University, July 1983, mimeo.

8. Common performance measures in these studies include profit rates, deposit rates, commercial loan rates, automobile loan rates, service charges and banking hours.

See Osborne and Wendell for an up-to-date review of the various surveys of this extensive literature.

9. In econometric modeling parlance, structure and entry would be related through an identity, and structure would be a redundant variable.

10. A firm employing an entry-limit pricing strategy adjusts price to maximize the present value of long-term profits taking into account the fact that the flow of new entrants is positively related to the profits enjoyed by incumbent firms. For a discussion of limit pricing in the context of banking, see Timothy H. Hannan, "The Theory of Limit Pricing: Some Applications for the Banking Industry," *Journal of Banking and Finance*, October 1979, pp. 221-234. See also, D. Hay, "Sequential Entry and Entry Deterring Strategies in Spatial Competition," *Oxford Economic Papers*, July 1976, pp. 240-257.

11. See Weisacker (1983). One example of a potential cause of sub-optimal entry is the existence of positive externalities of the activities of one firm on another. Weisacker also argues that the existence of economies of scale in a game-theoretic oligopoly pricing context could lead either to sub- or supra-optimal entry from an efficiency standpoint.

12. In the traditional theory of the firm, there are no impediments to the exit of firms from the marketplace. Exit normally is viewed as occurring because of random processes related to the allocation of management skills, cash flow problems and other situations specific to the firm. There is no *a priori* reason to expect a relationship to exist between exit rates and concentration. In the banking industry, most firms exit by way of merger with another firm. True exit of capacity is observed, however, in the case of individual bank branches. Entry and exit processes for both banking firms and branches are studied below.

13. There has been considerable debate over the years concerning which, if any, demand or cost conditions confronting a firm can result in the erection of "barriers to entry." Bain (1951) argued that entry could be impeded if (1) incumbent firms enjoyed cost advantages not available to new entrants, (2) economies of scale existed or (3) products were differentiable. Stigler (1973) dismissed the second and third factors as barriers to entry and argued only for the case of incumbent cost advantages. Subsequent authors have argued that both views are inappropriate because they focus on entry *conditions* rather than the consequences on efficiency of the factors enumerated.

In particular, we are not concerned with barriers to entry *per se*, but rather whether certain cost or demand conditions can lead to sub-obtimal entry and attendant efficiency losses. When viewed from this perspective, Bain's original list of factors have the *potential* to lead to suboptimal entry and inefficient production, but the precise outcome depends upon numerous other assumptions (see Weisacker 1983).

In addition, factors other than those enumerated by Bain can lead to sub-optimal entry including positive externalities to production. (For example, a firm may have to spend a considerable amount of money to design a successful product or a marketing strategy. If the firm recognizes that it will be unable to keep its potential rivals from obtaining the same information subsequently without cost, it may be deterred from entering the market.) For additional debate concerning the relevance or irrelevance of demand and cost conditions on entry, see Michael Spence, "Entry Capacity, Investment and Oligopolistic Pricing," *Bell Journal*, Autumn 1977.

14. Our study terminates in 1980, however, to avoid any perturbing influence of the major changes in banking legislation that occurred in 1980 and 1982 at the federal level and also because of lags in the availability of certain demographic and economic variables employed in the study.

15. The Herfindahl (or, more properly, the Herfindahl-Hirschman) Index is computed by squaring and summing the market share, in percent terms, of all firms in the marketplace. In our sample of California counties, this index ranges from about 1,000 to its theoretical maximum (10,000). Alternative measures of concentration frequently employed are the three-, four- and five-firm concentration ratios computed, respectively, by summing the market shares of the largest three, four or five firms in the marketplace.

We examined the use of the three-firm concentration ratio in lieu of the Herfindahl Index. For California, at least, there appears to be no important difference and we have chosen to report only the Herfindahl results in the tabulations that follow.

The Herfindahl Index presently is employed by the United States Department of Justice in formulating its merger guidelines. Presently, the Department of Justice considers any market with a Herfindahl Index in excess of 1800 to be concentrated. By this criterion, most of the county markets defined in this paper are concentrated.

16. See Osborne and Wendell (1983), Section V, for a discussion of this issue.

17. See Stoltz (1976) and Osborne and Wendell (1983).

18. See the evaluation of the work of Stolz (1976) in Osborne and Wendell (1983), Section V.

19. Hannan (1983), for example, used local labor market and employment pattern data to define nearly this many markets for the (much smaller) state of Pennsylvania. He did find, however, that his results were relatively insensitive to variation in the definitions of geographic market areas. Given the comparatively benign weather and high quality road system enjoyed by Californians, however, the relatively large size of the individual counties may not be inappropriate.

20. The rate stated in the chart is the rate occurring between the noted date and the two previous years. Thus, our data, while spanning 1972 to 1980, are able to report entry rates only from 1974 to 1980.

21. A simple, linear regression of deposit size in 1972 (SIZE) and a percentage change in deposits over the period (GROWTH) resulted in the following coefficient estimates and associated t-statistics:

$$\underset{\quad\ (6.8)\quad (1.0)}{\text{GROWTH} = 319.27 - 1.9 \times 10^{-5} \star \text{SIZE}},\ R^2 = 0.01,\ n = 95$$

Performing the same regression on a county-by-county basis yields less consistent results, with occasional signifi-

cant positive or negative coefficients on the SIZE variable. The absence of a consistent pattern and the small samples involved prohibit us from drawing any conclusions about these findings contrary to the general implication that the growth rates are independent of size.

22. Gibrat's Law demonstrates that, if a firm's growth rate per period is a random, normally distributed variable, the firm's size distribution ultimately will become skewed even if the initial firm size distribution is uniform. Thus, industries and markets can become concentrated in the absence of economies of scale or entry barriers by virtue of randomness in the outcomes of management selection processes, marketing decisions and other internal decisions affecting growth of a firm.

Such a process of concentration would not in itself be expected to affect entry since each firm is, by definition, confronted with the same distribution of "luck" in every period and thus this aspect of entry conditions remains unchanged over time. Indeed, the finding of growth rates unrelated to size militates somewhat against explanations of concentration based on economies of scale since these are permanent features of size not independently drawn each period. Gibrat's 1931 work was articulated by Michael Kalecki, "On the Gibrat Distribution," *Econometrica,* April 1945.

23. The database used in this study was constructed using data from the period 1972 to 1980. Several of the variables used in this study are rate variables, such as the entry rate, and the rates of population and income growth, and these are constructed using level measures of these variables at the beginning and end of two-year periods because of data availability.

The results reported here were run separately on each cross section as well as in the pooled variant presented. The results are qualitatively unchanged in the sense that the signs of variables significant in individual cross sections remained the same in the pooled sample although the enlarged sample results in improved standard errors for the estimates. In the reported regressions, growth rates are in decimal form. The Herfindahl Index is measured with a maximum value of 10,000 and all other variables are in level form.

24. Presently, the Department of Justice considers an increase in the Herfindahl of 200 points or more to be significant.

25. Personal income growth and population growth are computed by county from data provided by the California Department of Finance.

26. Attempts were made to test this notion by inclusion of non-bank measures of the capacity of the county markets. In particular, the *level* of personal income and population in the county markets was included in the regression formulation. In every case, however, these variables proved statistically insignificant and had inconsistent signs.

27. The relatively poor statistical performance of the lagged entry rate variables in the regressions reported in this paper may suggest, in fact, that the lagged adjustment formulation simply is inappropriate. We have not eliminated the lagged variable from the regressions, however, because at the very least this variable may perform some modest role in controlling for cross-sectinal variation in entry rates that is not explained by the variables included as arguments of our regressions.

28. In our sample, the mean rate of entry of new institutions is 15.2 percent (biennially). The mean rate of *de novo* bank entry (as a percent of total banks in the market) is 4.2 percent. Most *de novo* entry, however, involved one branch only. When compared with the total entry rate measured as the rate of change in the number of *branches,* the *de novo* entry figure appears somewhat larger, since branching growth is only 12.3 percent biennially in our sample period.

It is useful to note, however, that, for our sample at least, the rate of gross entry of banks exceeds the rate of gross entry of branches. Although it would be desirable to measure entry rates in terms of some meaningful measure of banking capacity, we were unable to do so and could only weight each form of entry similarly in these computations.

29. We also studied the relationship between concentration and profits directly in our work. However, because profit data are available only for the banking enterprise as a whole, whereas market concentration is measured at a local market level, we were forced to construct a concentration measure for the bank as a whole using deposit-weighted individual county concentration measures.

Whether because of this construction or because of the many problems with profit measures cited above, we were unable to find a consistent relationship between profitability and any of our structural or demographic variables.