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INCENTIVES FOR DIVERSIFICATION AND THE STRUCTURE OF THE CONGLOMERATE FIRM

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ABSTRACT

In this paper, we examine the proposition that both the structures of conglomerate firms and their merger activities evidence a systematic attempt to diversify income sources and reduce the volatility of firms' profits. We test whether firms that are active in one line of business are more likely to be involved in another, the lower is the correlation between returns to the two activities, and whether, ceteris paribus, the likelihood of merger depends inversely on the correlation of cash flows to the principal activities of the candidates for merger. We conclude that firms do act as if their goals include firm-level diversification.

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I. Introduction

In this paper, we examine the proposition that both the structures of conglomerate firms and their merger activities evidence a systematic attempt to diversify income sources and reduce the volatility of firms' profits.[1] Specifically, we test (1) whether firms that are active in one line of business are more likely to be involved in another, the lower is the correlation between returns to the two activities, and (2) whether, ceteris paribus, the liklihood of merger depends inversely on the correlation of cash flows to the principal activities of the candidates for merger. We conclude from our findings that firms do act as if their goals include firm-level diversification.

It is generally thought that business combinations are superfluous if they have no effect on the nature of the cash flows to the activities of participants. Such diversification would be redundant since investors can achieve identical results through appropriate structuring of their own portfolios. Differential efficiency, economies of scale or scope, increased control of input or product markets, influence over positive externalities, and other sorts of technological or "real" incentives may underly conglomerate organization. However, these factors provide no special incentive to choose combinations of activities with low correlations of returns when structuring the firm.

We propse four motives for conglomerate organization that would cause firms, ceteris paribus, to select combinations of minimally correlated activities. The benefits of these motives cannot be realized by portfolio diversification, i.e., each has real effects on cash flows. Since our theoretical models are developed only to the level necessary to illustrate the proposed motives, substantial theoretical questions are left unanswered.

In an important sense, our empirical analysis is partially exploratory and partially confirmatory. Other important motives for conglomerate organization of which we are aware provide no basis for expecting preferences over pairs of activities to depend on the correlations of returns to those activities. Our tests specifically address the issue of whether minimally correlated activities are more likely to be chosen. In essence, we test whether among all motives underlying conglomerate organization, those favoring systematic diversification are sufficiently strong relative to others as to be manifest in the data. If so, the collective importance of these motives will have been confirmed.

Our analysis is exploratory in that we are unable to discriminate between the proposed motives based on the data. More vigorous theoretical developments of these motives would presumably suggest ways of discerning the effects of each on firm behavior. Lines of inquiry we view as potentially fruitful are pointed out in the paper.

The first two motives for firm-level diversification center on the role of contracts and incentives in determining firm behavior. We argue that the profit stream of a diversified firm can provide a better basis for management incentive contracts than that of a specialized firm because it constitutes an indicator of effort and expertise that is less sensitive to random disturbance. Second, to the extent that the effects of non-systematic disturbances are moderated, the risk perceived by managers will correspond more closely to that of fully diversified owners, and the decisions made by managers will more nearly approximate those desired by owners.

Two motives for conglomerate diversification are derived from the technology of production and valuation under uncertainty. First, an input to the production process, broadly construed, can be used more efficiently by the

conglomerate firm than by the single-activity firm if 1) it must be acquired before output decisions are final, 2) cannot be costlessly stored or exchanged between firms, and 3) has some value in alternative employment within the conglomerate firm. The final motive for conglomerate diversification comes from portfolio-theoretic models of capital market equilibrium, which imply externalities in valuation. To the extent that a firm's profit contributes to the nature of the distribution of the return on the market portfolio, the risks of all assets and thus their values are affected by the firm's decisions. Therefore, a firm may diversify to gain control over the level of activity in a line of business closely related statistically (not necessarily technologically) to its own.

Our analysis focuses on the nature of conglomerate organization, i.e., the choice of activities to be undertaken from a menu that excludes vertically or horizontally related activities. We make no attempt to explain empirically or theoretically the extent of conglomerate organization. Presumably, the severity of antitrust legislation and the vigor of enforcement affect the extent to which firms seek new activities that offer benefits from diversification rather than the widely recognized benefits of specialization. Moreover, the concentration of one's own industry would affect the desirability of conglomerate investment by constraining other choices. We attempt empirically to identify motives for conglomerate organization by looking at patterns of activities rather than at the extent of conglomeration relative to specialization.[2] As progressively less attractive combinations are considered, the limits of each motive will eventually be reached, at a stage of diversification that depends on transaction costs. Thus, specialized firms can be observed, as could be any degree of conglomeration, depending on the costs of undertaking an acquisition or expansion.

It is important to recognize that the benefits of conglomerate organization referred to above cannot be gained through the activities of stockholders in structuring their personal portfolios.[3] Cash flows of the conglomerate firm are fundamentally different from those of the single-activity firm, not just repackaged. Although some benefits could be realized through naive diversification by the firm, if cost is incurred in adding or maintaining lines of business through acquisition or direct investment, it will be more efficient to combine activities that are minimally correlated. Therefore, not only do these motives provide further justification for conglomerate organization, but our theoretical arguments advance a strong, testable proposition about the choice of activities by the conglomerate. Ceteris paribus, firms will undertake minimally (preferably, negatively) correlated activities.

The remainder of the paper is organized as follows. In Section II the theoretical arguments that motivate our tests are developed. The data used, the tests conducted, and the results obtained are described in Section III. We conclude, in Section IV, with suggestions for further work, including direct, separate tests of the proposed incentives for firm-level diversification.

II. Motives Underlying the Organization of the Conglomerate Firm

The point of departure for our analysis is a recent, thorough critique of the literature on conglomerate merger provided by Copeland and Weston [5]. We concur with their conclusion that to be credible a proposed motive for conglomerate organization must be shown to affect cash flows. Purely financial motives -- those involving a reorganization of claims against unchanged income streams -- have no basis in theory [10]. Managerial theories, such as those posutlated by Grabowski and Mueller [12], are

inconsistent with the empirical evidence. Synergy arising from economies of scale in activities that are common to diverse lines of business is one likely motive for conglomerate organization. Lemelin [18] focuses on motives of this kind. Other motives that we describe subsequently meet the condition that they potentially affect cash flows, and more importantly imply a specific, testable pattern of conglomerate organization: the combination of minimally correlated activities.

Agency Costs--Profit-Based Contracts

The source of the first motive we investigate is the "economic theory of agency," considered by Alchian and Demsetz [1], Wilson [29], Ross [22], Jensen and Meckling [17], and others. An agency relationship exists when the welfare of one party, the principal, depends on the actions taken by another, the agent, under authority granted by the principal. The relationship between owners and managers is one agency relationship in an economic setting. Other examples are lender and borrower, manager and subordinate, insuror and insured.[4] Usually, both principal and agent are portrayed as rational and selfish actors who are aware of each other's motives. The focus of the analysis is on the resolution of a moral hazard problem: the agent will expend the least effort consistent with receiving a compensation schedule of given value. The "principal's problem" is to induce the greatest effort on his behalf from the agent, given the value of the compensation (fee, incentive) schedule, and to choose the contract that maximizes the value of the payoff to the owner, a product of the value of the contract and the effort induces.

Harris and Raviv [13; 14], Shavell [26], and others have considered the structures of incentive contracts that arise to resolve the "principal's problem" under a variety of circumstances. If the agent's effort can be

exactly measured by direct observation or inferred from some indicator of the firm's performance, a contract can be designed that will resolve the conflict entirely. Moreover, if agents are less risk averse than are principals, the principal has no comparative advantage as the residual risk bearer. In that case, the optimal arrangement is for the agent to rent the firm's capital for a fixed fee. No better arrangement for risk bearing exists, and the moral hazard problem is eliminated entirely since the principal's compensation is independent of the agent's effort.

If principals are less risk averse than agents and the agent's effort can never be known precisely, the optimal contractual arrangement provides the agent with compensation that is contingent on the firm's performance, and the expected level of compensation to the agent is at least as large as his reservation wage for that level of effort which he will choose as optimal. The optimal contractual arrangement maximizes the well-being of the principal, who correctly anticipates the level of effort chosen by the agent.[5] Since contracts of this form appear to be predominant in practice, we will continue under the above assumptions.

If firm-level diversification reduces the dependence of profits on random factors, the ability of owners to monitor the performance of managers will be enhanced because profit will be a more precise measure of the effort expended by management on behalf of owners. Managers will benefit because the risk they bear in accepting an incentive schedule based on profit will be reduced (since their efforts will more precisely determine profits), and owners will be willing to place more resources under the control of managers whose efforts can be more accurately assessed. Finally, owners will benefit because managers, subject to less risk, are willing to provide a given level of effort in exchange for a contract with lower expected return. Since the compensation

demanded by the agent for risk bearing is greater than the value of the risk reduction as perceived by the principal, any reduction in the influence of random factors on the performance of the firm will permit an increase in aggregate welfare.

The improved efficiency of contractual arrangements provides a motive for conglomerate organization:[6] Suppose firms A and B have profit streams that, conditional on managers' efforts, are distributed with correlation ρ, where $\rho < 1.0$. Now, suppose the activities of the two firms were combined within one organization at one-half the scale so the manager's effort would not be diluted. Then, the manager would derive greater utility from the same level of effort, given a contract based on income, and could be made at least as well off by some contract more desirable to owners.[7] This is so since expected compensation is unchanged, while the variance is reduced (recall $\rho < 1.0$).[8] The lower is ρ, the greater the increase in welfare. Therefore, presuming combinations are not costless, minimal values of ρ will optimally be sought.

What factors limit these gains? First, an agency problem between managers arises from the dependence of individual fee schedules on total profit, that might be avoided in some instances by reducing the scale of operation and combining diverse activities under the direction of a single manager. Unfortunately, managerial talent is not nearly so general and readily transferable as would be the ideal, and certain operations benefit from technological economies of scale. Casual observation would suggest that managers' compensation schemes are often designed to provide rewards based both on the consequences of their separate efforts and on the basis of firm performance. Our analysis does suggest that such schemes are likely to be desirable as attempts to gain the benefits noted above while responding to the manager-manager agency problem.

The second motive for conglomerate organization we consider derives from aspects of the agency relationship considered by Ross [22; 23] and Heckerman [15]. Since the manager's compensation must be tied to the firm's profit in order to achieve proper motivation, the risk perceived by the manager depends on uncertainty about profits. Managers not only choose the level of effort they will expend, but also make decisions that affect the riskiness of the firm's activities. If the perceptions of risk by owners and managers differ, another type of agency problem exists.

Owners are usually assumed to be fully diversified, in the sense of the capital asset pricing model [25; 19; 21]; therefore, the relevant measure of risk to the owner is the firm's beta.[9] In contrast, managers derive a disproportionate share of their income from their salaries (equivalently, their wealth is disproportionately in human capital). Since compensation is tied to firm profit they view risk as proportionate to the variance of profit. A second agency problem thus arises because the manager would exchange some expected return for a reduction in the non-systematic component of the variance in the firm's profit, but the owner is unwilling to do so.[10] The difference constitutes a conflict that may be costly to both parties.

To the extent that the non-systematic component of the variance of profit is reduced through firm-level diversification, this agency problem is mitigated and both owners and managers benefit. Indeed, if the non-systematic component of profit variance can be eliminated, variance and beta will be linearly related, and a reduction in one will reduce the other. The motives of owners and managers can then be brought close together by appropriate choice of the terms of the incentive contract. The problem will be no more severe than if owners' and managers' perceptions of risk were identical.

One implication of agency problems is the desirability of having firms consist of lines of business that have minimally correlated non-systematic return components. That motive would lead us to observe behavior that is consistent with our hypothesis that firms will choose activities with minimally correlated total returns -- (systematic plus non-systematic).

Technological Economies

Suppose some factor of production must be acquired in a fixed quantity before the state of the economy and actual requirements for the factor are known with certainty. To the extent that the factor is mobile and may be allocated to a specific use once demand is known, efficiency is evidenced. Often, however, market institutions, transactions costs and other considerations would seem to hinder -- even preclude -- such recontracting. For example, managers, perhaps the least specialized of all resources, may require compensation for the uncertainties inherent in such a recontracting arrangement. Further, owners may hesitate to share managerial talent when managers possess proprietary or privileged information. As another example, the sharing of marketing channels of distribution may expose the firm to the risks of losing certain exclusive rights or revealing valuable information. Plant and equipment may not be mobile, though flexible in possible uses, and transportation costs for materials and finished goods may preclude rental. If sharing between firms is costly, an incentive exists for the formation of conglomerate organizations. Of course, that result is a fundamental insight of Coase [4].[11]

The proposition put forth above is easily confirmed by a more formal argument. Suppose firms 1 and 2 operate respectively and exclusively in industries 1 and 2. Let r_1^s and r_2^s be the returns to capital equipment employed in industries 1 and 2 if state of the world s obtains, and P_s be the

value of a dollar to be received if state s obtains. Then the values of firms 1 and 2, V_1 and V_2, are

$$V_1 = \sum_{s \in S} P_s r_1^s K_1; \; V_2 = \sum_{s \in S} P_s r_2^s K_2 \tag{2.1}$$

where K_1 and K_2 are capital employed in the indicated industries and S is the set of all possible states of the world.

Now suppose the K_1 can be utilized in industry 2, where it would be equivalent to $C_{12}K_1$ units of capital equipment intended for exclusive use in industry 2; K_2 is similarly convertible at a rate of C_{21}.[12] The two firms operating in concert can produce a maximum return in state s of

$$\begin{cases} r_2^s [C_{12}K_1 + K_2] & \text{if } r_1^s / r_2^s < C_{12} \\ r_1^s K_1 + r_2^s K_2 & \text{if } C_{12} \leq r_1^s / r_2^s \leq 1 / C_{21} \\ r_1^s [K_1 + C_{21}K_2] & \text{if } r_1^s / r_2^s > 1 / C_{21} \end{cases} \tag{2.2}$$

The value of the combined firm must be at least as great as the sum of the values of the two operating independently. This is so since capital need never be converted unlesss it is desirable to do so and K_1 and K_2, the amounts optimal under the old regime, may be chosen if that remains the best decision.

It is evident that the greater the tendency for returns in one industry to be higher than their mean when returns in the other are lower than their mean, the greater will be this incentive for conglomerate organization. We have therefore identified a third incentive for systematic, firm-level diversification. The limits of this motive are reached where the costs of

conglomeration exceed the benefits as the values of C_{12} and C_{21} become smaller.

Externalities

The firm may benefit from control of both K_1 and K_2 even if no sharing of resources is possible, if the market valuation of the two firms is determined according to the capital asset pricing model (CAPM) of Sharpe, Lintner and Moss in [25; 19; 21]. Here, we adopt the viewpoint of Jensen and Long [16], Stiglitz [28], Fama [7], Yawitz [30], and Greenberg, Marshall and Yawitz [11]. In this framework, the firm may control, in a constrained fashion, the covariance of its cash flow and the return to the market (the aggregate cash flow accruing to all assets). The firm's decisions include the choice of activities to be undertaken, prices charged for products, labor hired, capital acquired, and other economic variables. The objective is to maximize the market value of the firm as determined via the CAPM. In what follows we suppress all decisions save for the choice of activities the firm will undertake and the amount of physical capital to be acquired for each. The following notation will be used:

X_s^i The i^{th} firm's random cash flow from activities in industry s.

X^i The total cash flow to firm i from all activities.

K_s^i Capital equipment of firm i used in industry s.

P_s Random return per unit of capital used in industry s.

S^i Capital market value of firm i.

r Market rate of discount on riskless investments

λ Market price of risk.

X^m Aggregate cash flow on all firms.

K_s Capital equipment employed in industry s by all firms other than the i^{th} firm.

$E(\cdot)$, $Cov(\cdot,\cdot)$ Expectation, covariance operators.

$\mu_s = E(P_s)$,

$\sigma_{st} = Cov(P_s, P_t)$.

According to the CAPM[13], the value of the firm is determined to be

$$S^i = (1/r)\,[E(X^i) - \lambda Cov(X^i, X^m)] \tag{2.3}$$

To demonstrate that there is an incentive for joint operation in two industries (1 and 2 for convenience), consider firm 1 that operates only in industry 1 and finds the use of K_1^1 units of capital equipment to be optimal. The value of the firm is

$$S^1 = (1/r)\,[\mu_1 K_1^1 - \lambda Cov(P_1 K_1^1, X_m)] \tag{2.4}$$

and

$$Cov(P_1 K_1^1, X_m) = E\{[(P_1 - \mu_1)K_1^1]\,[P_1 K_1^1 + \sum_j P_j \tilde{K_j}]\} \tag{2.5}$$

$$= (K_1^1)^2 \sigma_{11} + \sum_j K_1^1 \tilde{K_j} \sigma_{ij}$$

If the price of a unit of capital equipment is π, then the optimality of K_1^1 requires that[14]

$$\pi = \mu_1 - \lambda[2K_1^1\,\sigma_{11} + \sum_j \tilde{K_j}\sigma_{1j}] \tag{2.6}$$

or

$$K_1^1 = 1/2 \{[(\mu_1 - \pi)/\lambda\sigma_{11}] - [\sum_j \tilde{K_j} \sigma_{1j}/\sigma_{11}]\} \quad (2.7)$$

The dependence of S^1 on the capital investments of all other firms is evident from equation (2.5). Similarly, equation (2.7) indicates the influence on K_1^1 of others' valuations and decisions.[15] In this case, the motive for cooperative behavior arises because of the externality that results from the appearance of covariances in the equilibrium valuation expression. Suppose that firm 2 operates entirely in industry 2 and employs K_2^2. The effect of an increase in K_1^1 on S^2, ceteris paribus, would be

$$\partial S^2/\partial K_1^1 = -\lambda K_2^2 \sigma_{12} \quad (2.8)$$

If $\sigma_{12} < 0$, then firm 2 would be willing to pay firm 1 to extend K_1^1 beyond the level indicated by equation (2.7). On the other hand, if $\sigma_{12} > 0$ then firm 2 would willingly pay firm 1 to restrict K_1^1 below the otherwise optimal level. Firm 2 might offer side payments or attempt coercion by threatening to use K_2^2 to affect S^1 or threatening takeover to capture the externalities. In either case, cooperative behavior would be Pareto superior, but may be constrained by law or inhibited by information and agency problems.

The advantages of cooperative behavior can be obtained through merger, while avoiding the difficulties of repeated bargaining between firms. By comparison, de novo entry suffers from certain deficiencies. If $\sigma_{12} > 0$, de novo entry offers no benefits. Second, de novo entry rather than merger leaves the potential influence of other firms unchanged. In summary,

financial externalities provide a motive for merger that is greater, the greater is the absolute value of σ_{12}; de novo entry is a less potent strategy, but offers some benefit, if $\sigma_{12} < 0$.

Our analysis has implications for the effects of concentration on merger activity. In particular, if $\sigma_{12} \neq 0$ and firm 1 acquires firm 2 and modifies its level of activity, then all other firms in industry 1 benefit in proportion to their levels of capital investment. The greater the level of concentration in the industry, the greater the average investment of each firm, and the greater the incentive, on average, to merge with firm 2. This may be especially important where there are transaction costs to be covered for merger to be desirable. In addition, there are incentives for a firm that intends to acquire another (for motives such as those described above) to first acquire as great a share of its own industry as is possible. Implications of these incentives are not considered further herein.

Summary

We propose that motives for the conglomerate organization of firms are provided by a) reduction of agency costs as the relative importance of random disturbances to profits is reduced and the usefulness of profit as a basis for incentive contracts is enhanced, b) reduction in agency costs as managers' and owners' perceptions of the firm's risk are brought in closer correspondence, c) increased efficiency in the use of input factors that must be acquired before demand is known, and d) control of levels of activities in firms that have significant financial externalities on others through relationships between cash flows. Since none of these benefits can be attained by investors diversifying their personal portfolios, diversification at the firm level need not be redundant.

III. Empirical Evidence of Diversification of the Conglomerate Firm

In this section we test two hypotheses suggested by our analysis. The first is that merger is more likely, ceteris paribus, the lower is the correlation between the returns to the primary activities of the two potential merger candidates. Second, a firm doing business in one industry is more likely to be active in a second industry the lower is the correlation between the returns to activities in the two industries, ceteris paribus. Although these two hypotheses are related, the second is somewhat broader than the first because the composition of a firm's activities depends on de novo entry as well as merger.

Mergers

We address first the issue of merger activity. The proposition to be tested is that mergers between members of two "different" industries will be more likely to occur, ceteris paribus, the lower the correlation between returns to activities in the two industries. To test that proposition, we compute correlations between the net cash flows to several manufacturing industries and record the numbers of mergers between each pair of industries. We hypothesize that the cash flow correlations and numbers of mergers will be inversely related, other factors being equal.

The data and methodology employed to measure the correlations of returns to activities in different industries are the same for the analysis of merger activity and that of firm-level diversification, although different levels of aggregation are used to define industries. From the Annual Survey of Manufactures [2] we draw data on the income flows to each of the manufacturing industries included in Standard Industrial Classification (S.I.C.) codes 200 through 399.

For the purpose of computing correlations between returns to various activities, we estimate a cash flow for each industry as follows: from the value of industry shipments we subtract the cost of materials, wages and salaries, and new capital expenditures. Clearly, this measure of cash flow is incomplete, for such costs as advertising and shipping are not included except as they are paid to labor. New capital expenditures are included on the assumption that a going concern must constantly replenish its capital stock.[16]

To the extent that deductions from cash flows not captured in our measure are either constant over time or proportionate to measured cash flows, the correlations computed from these numbers are unaffected. In addition, errors in the measurement of the cash flows will introduce error in the measurement of correlations, biasing against confirmation of our hypotheses when correlations and conglomerate structure are compared.

The survey data are collected at the establishment level to achieve more accuracy in identifying industry cash flows. Firm level data might permit more accurate measurement of cash flows, but the errors in attributing the cash flows to a single industry, or in attempting to allocate to different activities of a single firm, would be extreme. In our view, the costs and benefits favor the use of ASM data over firm-level data.

To obtain the correlations, we first detrend the cash flow series. Defining π_{jt} as the net cash flow to industry j during period t, we compute

$$\pi_{jt} = a_j + b_j t + u_{jt} \tag{3.1}$$

using annual data over the period 1958-1971, where a_j and b_j are coefficients to be estimated and u_{jt} is the residual. The correlations, C_{jk}, are computed from the estimated regression residuals, $\hat{u}_{jt}$ and $\hat{u}_{kt}$, for all pairs of

industries. The π_{jt} series are detrended on the assumption that market participants can anticipate trends, which are reflected in expectations; the relevant notion of risk in a mean-variance world is based on the deviation of actual from expected returns. Where trends exist, correlations computed around raw means would be misleading: declining industries may appear to be negatively related to growing industries or those that are secularly stable, even if the rate of decline could have been anticipated.

Linear trends fit the data well, although exponential growth might have been expected to do better. Recall, however, that the calculated cash flow is closer to a profit measure than to a measure of sales, and that it is net of new capital expenditures. Inflation and a constant rate of growth will affect capital expenditures as well as profits. These factors and changing profit margins might explain the adequacy of a linear model for trend.

The merger data used, at the two digit level of S.I.C. code, come from the Statistical Report on Mergers and Acquisitions [27], (hereafter, Report), of the Federal Trade Commission. This source records mergers of firms and acquisitions of subsidiaries or divisions along with the primary S.I.C. codes of the participants. The Overall Merger Series of the Report [27] provides approximately 1000 recorded mergers for which the primary S.I.C. of both acquiring and acquired firm was given. The S.I.C. codes recorded are those of the firm, subsidiary, or division acquired, and of the primary activity of the acquiring firm. Although divisions and subsidiaries acquired in mergers are likely to be predominantly involved in the specified industry, firms often have significant activities outside of their primary industry. Nevertheless, for lack of better data, we use primary industry classifications to represent the motivating concerns of participants. This assumption should bias against empirical substantiation of diversification as a motive for merger. Where M_{jk}

is the number of mergers between participants in industries j and k over the period 1973-75, our hypothesis is that M_{jk} and C_{jk} will be inversely related, all else being equal.

In part as a practical consideration, this analysis utilizes data aggregated to the two-digit level. The tendency to merge should depend on the relative magnitude of the correlation of a firm's income stream with income streams of all potential merger candidates. At the individual firm level, the number of potential candidates is overwhelming. In addition, the finer the industry classification scheme employed, the fewer the number of mergers that would be observed between any two industries over any period of time sufficiently short for stability of the C_{jk} to be assumed. For many industries, low values of M_{jk} are observed even when data are aggregated to the two-digit level, a lack of variation that impedes the statistical analyses. On the other hand, aggregation across industries may reduce the range of computed values of C_{jk}, especially if negative values are as rare as is commonly believed. As a compromise, we settle on a two-digit level of analysis.

For reasons of data availability, the empirical work presented below is confined to the manufacturing sector of the economy. This restriction is unfortunate because there may be important negative covariances across sectoral lines -- perhaps, for example, between electrical machinery and fast food establishments. On the other hand, since the restriction to manufacturing most likely eliminates some mergers undertaken to achieve vertical integration, and since vertically integrated firms should display moderately high positive correlation, our data should permit the effect of negative covariances to be seen more clearly. We exclude within-industry mergers, which are likely to take place for market power and/or production-

related reasons. Our analysis does not control for vertical market and technological factors that might influence mergers except that the exclusion of non-manufacturing industries eliminates the possibly large numbers of mergers that might be expected to take place between manufacturer and distributor. The determination of whether the baby is thrown out with the bathwater by this exclusion will have to await improved data. The input-output structure of the economy might be used in future empirical work to control for vertical integration, and concentration coefficients could be utilized to control for market power. Then, both non-manufacturing and manufacturing data might effectively be used, if available.

Table I presents the computed values of C_{jk} and M_{jk} in matrix form. The principal diagonal and upper half of the matrix contain the M_{jk}; the lower half contains the C_{jk}. It is interesting to note that several of the C_{jk} are negative, whereas negative correlations of returns on equity securities are extremely rare. One possible explanation of this is that total cash flows to firms are seldom negatively correlated because firms choose the activities in which they engage to accomplish within-firm diversification. In that case, a firm would tend to be active in industries with which it might otherwise be negatively correlated. Negative correlations between within-firm activities would therefore tend to be muted or swamped by positively correlated activities in analysis of aggregate firm cash flows.

As with the correlations, a broad range of values of M_{jk} is observed. Intra-industry mergers are predominant, and little else is immediately evident. For each industry, Spearman rank-order correlations were computed between the income correlations and numbers of mergers with <u>other</u> industries. The hypothesis is that these correlations will tend to be negative. We use rank correlations because nothing in our theory suggests a

linear relationship between the M_{jk} and C_{jk}, and the rank correlation is a more robust measure of association than a product-moment correlation. As can be seen from Table II, fourteen of twenty are as predicted. On the null hypothesis that merger activity is independent of income correlation, the probability is less than .06 that fourteen or more negative correlations will be observed. This finding is stronger than the test indicates since we have not fully controlled for synergistic, vertical, and technological motives for merger, which are strongest among firms with positively correlated income streams. We conclude that this evidence supports the hypothesis.

A firm can unilaterally decide to enter an industry, but must obtain the cooperation of a partner to effect a merger. That difference substantially complicates the analysis of mergers. As a result, the rank order correlations reported above are conservative because no allowance is made for the numbers of mergers in which each industry is involved, an endogenous variable, or the possible difference in relative attractions of one partner for another. On this latter point, industry A may prefer a merger with B over all other candidates, but it is unlikely, given the data, that B also prefers A over all others. These considerations make more detailed empirical analysis desirable, although the bias in the simple tests, if any, would seem to favor acceptance of the null of no association.

In recognition of the endogeneity of the level of merger activity, expected numbers of mergers were computed for each pair of industries based on the hypothesis that the probability of a merger between firms in two industries depended only on the proportion of total mergers involving each (ie., marginal independence). The subsequent regression and logit analyses dealt with ratios of actual to expected numbers of mergers, and discrete representations of that data.

The other complicating factor is the necessity that two firms consent to a merger, that is, the bilateral nature of the act. To measure the relative attraction perceived by one industry, say A, of a merger with another, say B, we use the rank of the correlation between A and B among all correlations involving A. The rank of the correlation between A and B among all correlations involving B measures B's perceived attraction to A. On the assumption that neither firm enjoys any advantage in bargaining, their perceived attractions should receive equal weight in the decision. Consequently, the causal variable in this analysis is the sum of the ranks.

Results of the logit estimation are reported in Table III. Since intra-industry mergers are ignored, from the symmetry of the merger data there are $n(n-1)/2 = 190$ independent observations for analysis. The dependent variable is 1 or 0 depending on whether the actual number of mergers exceeds or is less than the expected number. For Model A, the coefficient on the attraction variable, the only dependent variable, has the hypothesized sign but is not significant.

The causal variables used in Model B are a set of dummies based on the quintile structure of the attraction variable, as described in Table III. Since the coefficients on R2-R5 are marginal contributions to the standard of the first quartile, each should be negative, as all are, and successive coefficients should decline in value, as they do not. Again, the data mildly support the hypothesis.

Table III also reports the results of OLS estimation of a simple model (Model C) relating the ratio of actual to expected numbers of mergers and the attraction variable. The Model C results must be interpreted with caution. First, the dependent variable is bounded at zero and although the zero observations are excluded, coefficient estimates are biased (albeit, against

the hypothesis. Second, we have no reason to believe that the model is linear in the attraction variable, only that it is monotone. Although correct estimation procedures are known (e.g., extensions of logit with ordered categories based on dummy variable representations of the attraction variable), the marginal value seemed small relative to the difficulties of implementing these procedures. We report these results for their descriptive content and simply note that again the coefficient estimate is as hypothesized.

In sum, the merger analysis provides significant, but moderate support for the hypothesis that firms attempt to systematically diversify via their choices of partners in conglomerate mergers. The relationship may be somewhat obscured by the bilateral nature of the decision to merge. We turn now to analysis of the structure of the conglomerate, where the alternative of direct entry may mitigate this difficulty.

Structure of the Conglomerate Firm

Eventually the structure of a firm's participation in various industries will reflect a sustained pattern of merger and investment activity. We hypothesize that a firm in one industry is more likely to be in another, the lower the correlation between income to the two industries. A test of this hypothesis is far stronger evidence on the validity of the underlying proposition of firm-level diversification than is a test of mergers, since a structure test is less susceptible to distortion by temporal influences on motives. Moreover, structure reflects both merger and direct investment activities.

There exist no readily available and appropriate data on the extent of participation by conglomerate firms in various industries. Public financial reports and statements of individual companies are not sufficiently detailed

or consistent in the line-of-business classification scheme used. As an alternative, we construct a measure from information reported in Enterprise Statistics, 1972 [6]. Let j and k denote three-digit industries. The enterprise data give E_{jk}, the number of workers in industry k who are employed by firms that also participate in industry j. We use w_k, the average value added per worker in industry k, to construct $V_{jk} = w_k E_{jk}$. V_{jk} is value added by all firms in industry j through their activity in industry k. Finally, we compute $\varepsilon_{jk} = V_{jk} / \sum_k V_{jk}$, where the denominator is taken over all three-digit industries (industry k). ε_{jk} is the proportion of the total value added of firms in industry j that is due to their presence in industry k. The ε_{jk} are analogous to the weights of securities in portfolios. For each j, these weights measure the relative importance of each source of income to firms that are active in industry j.[17]

Our hypothesis is that ε_{jk} and C_{jk} are inversely related. Two circumstances beyond those mentioned in discussion of the merger tests are likely to bias our findings against affirmation of the hypothesis. First, there is presumably some threshold level of size for each industry below which the enterprise is not economically viable. Therefore, we may observe no participation in cases where the desired level of participation is below the threshold. Second, ε_{jk} may be small even if V_{jk} represents a substantial proportion of all value added to industry k: firms in industry j may control virtually all of industry k, but ε_{jk} will be small if industry k is small relative to all activities of firms in industry j. As a rough method of dealing with these problems we use the discrete form of ε_{jk} defined below. Our inability to incorporate these two factors explicitly should bias against the finding of an inverse relationship between C_{jk} and ε_{jk}, making an affirmative result stronger.

Our analysis of the relationshiop between ε_{jk} and C_{jk} uses both continuous and discrete forms of those variables, where the latter are defined as

$$\varepsilon'_{jk} = \begin{cases} 1 & \text{if } \varepsilon_{jk} > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$C'_{jk} = \begin{cases} 1 & \text{if } C_{jk} > 0 \\ 0 & \text{otherwise} \end{cases}$$

The primary concerns motivating our use of discrete versions of the data are the desirability of non-parametric tests of the relationships, the possibility that a threshold problem might result in a massing of observations on ε_{jk} at zero, and the possibility the ε_{jk} is small because industry k is small relative to j.[18]

The first step in our analysis was to compute summary statistics on the joint distribution of ε_{jk} and C_{jk}. Data are available for the 31 three-digit industries listed in Table IV, providing 30 values of ε_{jk} and C_{jk}.[19] In an attempt to reduce the influence of technological considerations, for each j we eliminated those observations for values of k within the same two-digit industrial classification. Table V provides summary statistics on the joint distribution of ε_{jk} and C_{jk}, computed from the 'pooled' observations for all values of j. The correlation between C_{jk} and ε_{jk} is negative, - .039 with a p-level of .12, which is weakly supportive of our hypothesis.

The tests performed using the discrete version of the data provide stronger evidence in support of the proposed inverse relationship between C'_{jk} and ε'_{jk}. The pattern of observations reported in Table VI indicates the apparent popularity of negatively correlated pairs of activities: firms participate in a significantly greater proportion of pairs of industries with

negatively correlated income streams than of all pairs. This analysis was replicated for each three-digit industry taken separately. For 25 of the 31 industries, firms in the industry under analysis were in a greater proportion of industries with which their cash flow was negatively correlated than in other industries. The probability of this occurrence is less than .001 if no relationship exists. In addition, the large number of empty cells in tables for individual three-digit industries prompted us to sum three-digit tables within each two-digit industry for further analysis. The separate tables are presented in Table VI. The results for 11 out of 15 two-digit groups were as hypothesized. The probability is less than .059 of 11 or more negative relationships due to chance alone. These results are, in our opinion, strongly supportive of the hypothesis.

The externalities argument would suggest that the incentive to enter an industry varies with both the absolute value of the correlation between returns and the extent of concentration of the target industry. The latter effect is supposed to exist because the more concentrated the industry, ceteris paribus, the more influence the entrant can have over industry output and thereby over the externality. All the analyses reported above were repeated using a four firm concentration ratio, based on the Annual Survey of Manufactures [2] in addition to the inter-industry correlation. The relationship between industry structure and correlation was virtually unaffected. The concentration measure did have the predicted effect. Rather than present the extensive three way cross tabulations, that effect will be considered in the context of the following logit analysis of structure.

Logit analysis was used to investigate four models, for which results are reported in Table VII. For all models, the dependent variable is ε'_{jk}. The results for Model A are consistent with our earlier findings. However, as

concentration is introduced in Model B, the significance of correlation declines, as does the coefficient in absolute value. In Model B, both causal variables have the predicted sign, and concentration is significant. Models C and D are counterparts to A and B, with correlation replaced by a set of dummy variables so that nonlinearity, if present, might have less effect. The results are substantially the same as for A and B. In both models, the coefficients on C2-C5 are negative, as predicted, but successive coefficients do not decline, as the hypothesis requires. The pattern of coefficients here is remarkably similar to that obtained in analysis of the merger data, Model B of Table III. Again, the concentration variable has the correct sign and is significant, and when introduced diminishes the importance of correlation.

The logit analysis provides further support for the hypothesized relationship between industry structure and correlation. The evidence of an effect for concentration is consistent with an externalities motive, but we are hesitant to consider the evidence more than suggestive; the analysis does not provide for what could be many potentially confounding factors.

IV. Conclusions and Suggestions for Further Research

The empirical evidence supports the proposition that a systematic effort to achieve firm-level diversification underlies the structure of the conglomerate firm. That is, the activities outside of a firm's primary industry are in lines of business that are negatively correlated. As we have shown, incentives for such behavior have a basis in theory. Although our empirical tests do not distinguish between those potential incentives, the detection of a pattern in conglomerate organization would seem to be of interest to those who seek to forecast mergers and suggests the value of further investigation.

The incentives for conglomerate organization developed above might be separately tested, at least under ideal conditions. If the motive is a closer correspondence between managers' and owners' perceptions of risk, one implication is that, ceteris paribus, the probability of inclusion in a conglomerate organization will increase with the non-systematic risk of an activity. As noted in Section II, the strength of this incentive for combining two lines of business should vary with the correlation of the non-systematic components of profits, not necessarily the correlation of profits.

If the profit of a conglomerate provides a better basis than that of a single activity firm for incentive contracts, then those contracts a) should be more prevalent in conglomerate organizations, b) should depend more often and to a greater extent on firm profits rather than single lines of business for more diversified firms, and c) should provide lower average levels of compensation in the conglomerate, since less risk is borne by the manager, ceteris paribus.

With respect to the financial externalities argument, levels of activity ought to be affected when a firm adds a line of business. This incentive might empirically be differentiated from the factor-sharing motive by noting that no incentive for merger is present if the level of activity cannot be modified as a result of such considerations as existing contracts or limited availability of necessary inputs.

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FOOTNOTES

[1]By a conglomerate firm, we mean a firm engaged in two or more distinct lines of business where the motive for combining the activities under the control of one firm is not increased market power, vertical integration, or any conventional technological economy of scale. This definition is arbitrary, since lines of business are no less difficult to define and motives are inherently unobservable. But our usage is consistent with that found in the literature and in the business world.

[2]As an alternative, one might investigate changes in the intensity of diversifying investment which accompanies changes in the strength of the hypothesized motives.

[3]On the one hand, conglomeration may impede the selection of a portfolio by forcing one to purchase shares in several activities in a fixed proportion, but if each activity is represented separately by some other security, investors can "unbundle" and counteract this effect. On the other hand, superior knowledge of the nature of a firm's cash flows might enable managers to diversify better than investors. We ignore these aspects to focus on other than strictly financial motives for diversification.

[4]Harris and Raviv [13] use a variety of examples to demonstrate the general usefulness of the basic principal-agent paradigm.

[5]The costs that are incurred to motivate and monitor the agent are referred to as agency costs. These costs can be considered to be the cost of employing an organizational structure that separates "ownership" from "control." As Alchian and Demsetz [1] point out, owners who choose such an organizational structure presumably do so because it is more efficient. Thus, agency costs are no more or less desirable than are the costs of labor or materials. And, the agency cost component of total costs in no sense constitute an inefficiency.

[6]Ross [23], recognizes that an incentive to diversify through merger may be provided by the risk inherent in managers' incentive contracts. Also, mutual funds, as Ross notes, and separate firms that provide management services under contract offer possible alternative solutions to the problem.

[7]Note that the manager's compensation cannot be written as a function of the expected value and variance of profit, which are unobservable, but must be tied to some measure about which there can be no dispute, such as the actual value of profit observed. As accountants will attest, the problems in measuring profit, though simpler than measuring expectations, are not trivial, and the contracting parties must agree on the basis for measurement ex ante.

Also, some portion of the randomness in the firms' profits could be attributed empirically to industry factors, input prices, and similar observable variables that might be incorporated into contracts. It is the residual risk, after these controls are implemented, that causes an inefficiency that might be reduced by diversification.

We stress that the benefit derives from the manager's effort being allocated over several activities, so the average (or equivalently total) outcome is a better measure of his effort. To simply tie the manager's compensation to a diversified income stream, the greater part of which is beyond his control, would be detrimental.

[8]To see this, let X_1 and X_2 represent the returns to firms 1 and 2 with $\mu_1 = \mu_2 = \mu$, $\sigma_1^2 = \sigma_2^2 = \sigma^2$, their respective equal means and variances. The manager's claim is to some proportion, say α, of income. The mean and variance of his return are $\alpha\mu$ and $\alpha^2\sigma^2$ before the merger. Subsequent to the merger, his claim is to $\alpha(\ X_1 + X_{2/2}\ )$, with mean $\alpha\mu$, and variance

$$S^2 = (\alpha^2/4)\ (\sigma_1^2 + \sigma_2^2) + (\alpha^2/2)\ \rho\sigma_1\sigma_2$$

$$S^2 = \alpha^2\sigma^2 - (1-\rho)\ (\alpha^2/2)\sigma^2$$

which is strictly less than $\alpha^2\sigma^2$ for $\rho < 1$. Further, $\partial S^2/\partial\rho > 0$, so the manager is better off, ceteris paribus, the lower is ρ.

[9]For an introduction to the capital asset pricing model, see Fama [8] or Fama and Miller [9]. In that model, the relevant measure of risk is the contribution of a security to the variance of a fully diversified portfolio, the market portfolio of all assets. That risk is measured by the covariance between the returns on the security and the market portfolio, and is referred to as systematic risk. Investors who hold full diversified portfolios endure only that systematic risk, since firm-specific, or nonsystematic, sources of uncertainty are eliminated by diversification. Since it is presumed to be no more costly to diversify, asset prices are determined so that compensation is provided only for systematic risk. The arbitrage pricing theory due to Ross [23] has essentially identical implications, for our purpose, at the cost of less restrictive assumptions.

[10]Here again, we assume that compensation schedules must be written in terms of actual observations drawn from the profit distribution, since the parameters of that distribution, including β, are unobservable. Also, we assume that diversification of the risk inherent in the manager's human capital via the market would be prohibitively costly (possibly due to the moral hazard problem).

[11]Maloney and McCormick [20] show that in the case where demand is known a factor of production that is subject to indivisibilities provides a motive for development of a multiproduct firm. As we argue, under uncertainty that motive exists even where input factors are not lumpy. Of course, in both cases costs in sharing or transferring the factor are necessary.

[12]By assumption, C_{12} and C_{21} are such that at the unit prices of K_1 and K_2 and given the distributions of r_1 and r_2, the initial allocations are optimal. If prices and distributions are identical, then C_{12}, and $C_{21} < 1$ is implied.

[13]The review by Baron [3] is recommended for those interested in the use of the CAPM for the purpose to which it is put here.

[14]The choice over other inputs could easily be incorporated explicitly, but it is sufficient to assume that optimal decisions are implicit in the distribution of P_{μ}. Note that separability, or constant stochastic returns to scale, is assumed. Generalization would not influence the aspect with which we are concerned here.

[15]As Ross [24] notes, this and other issues of externalities involving the CAPM revolve on whether the firm acts as a price taker in the capital markets. It may do so even though it is a monopolist in the product market or may not even though it is a competitor in its product market.

[16]Accounting treatment of depreciation, as well as other pertinent economic costs, varies across industries. Consequently, this cash flow measure is far from ideal. However, it does improve upon firm data, as described below. And we have no reason to believe that differences across industries in accounting methods bias our tests.

[17]Value added rather than employment is used because our concern is the extent to which firms diversify the sources of their cash flows. Continuing the securities portfolio analogy, if one were to use proportions of employees as weights it would be like using numbers of shares rather than weighting by share value.

[18]Ideally, one would provide for the massing of observations at zero by use of a bounded dependent variable technique, such as the Tobit model. However, we are not especially comfortable, given our data, with the necessary assumptions about the causal variable for such models. Our estimated cash flow correlations are naturally, bounded by -1 and +1. Moreover, they are measurements with error of the true correlations. Given all these problems, we are most comfortable to rely on the simple, categorical tests based on

C'_{jk} and ε'_{jk}.

[19]The three-digit classification scheme used in the Enterprise Statistics [6] differs from S.I.C. codes. Therefore, we were limited to the cases where a one-to-one relationship existed.

Table I

Number of Mergers (principal diagonal and upper half) and
Estimated Cash Flow Correlation (lower half) for 2-Digit S.I.C. Codes

S.I.C. Code	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
20	77	3	4	5	0	4	1	2	10	0	2	1	0	2	1	5	1	3	1	0
21	-.54	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	1
22	-.68	.61	11	7	2	3	2	0	2	0	1	0	2	0	2	0	2	1	0	1
23	.11	.75	-.12	8	0	1	0	2	2	0	0	1	3	0	3	1	3	0	1	1
24	-.22	.43	.73	.33	17	1	18	5	2	2	1	0	3	0	3	1	3	4	0	1
25	.07	-.16	-.13	-.40	.54	8	1	1	0	0	0	1	3	0	2	1	2	1	0	2
26	-.26	-.18	.51	-.06	.00	.82	19	4	4	0	4	0	0	2	2	2	0	0	1	3
27	-.63	.88	.86	.74	.72	.08	.56	37	1	0	0	0	0	1	0	1	2	1	2	5
28	-.36	.28	.81	-.53	.72	.02	.25	.60	62	3	6	1	9	4	7	12	8	4	11	8
29	-.01	-.40	.06	-.29	-.02	.22	.74	.04	.24	0	0	0	3	0	1	1	0	1	0	0
30	-.58	.91	.81	.88	.72	-.06	-.15	.93	.56	-.29	7	0	6	5	7	4	5	1	2	0
31	-.64	.74	.75	.26	.58	-.03	.56	.89	.64	.19	.77	1	0	0	0	1	1	0	0	2
32	-.95	.68	.84	-.02	.45	-.14	.20	.79	.54	-.09	.76	.74	8	4	8	2	2	1	3	3
33	.33	-.77	-.18	-.78	-.18	.33	.36	-.54	.25	.45	-.54	.36	-.38	14	20	11	5	7	2	0
34	-.51	.74	.78	.55	.73	.79	.46	.95	.54	.10	-.91	.82	.66	-.39	19	42	13	13	5	2
35	-.20	-.73	.40	-.61	-.07	.76	.64	-.07	.66	.89	-.63	.29	.10	.83	.13	60	39	20	10	11
36	.47	-.81	-.69	-.43	-.62	-.81	.42	-.87	-.46	.23	-.89	.63	-.62	.46	-.88	.75	60	10	14	4
37	.19	-.28	.16	-.15	.70	.33	-.26	-.11	.37	-.02	.05	.20	-.07	.37	.27	-.00	-.22	9	5	3
38	-.69	.89	.78	.64	.57	-.08	.32	.92	.44	-.13	.92	.84	.81	-.58	.87	-.31	-.74	-.10	12	0
39	-.49	.88	.73	.84	.69	.04	-.21	.87	.52	-.37	.96	.72	.68	-.48	.85	-.76	-.88	.06	.86	15

Sources: Annual Survey of Manufactures and Statistical Report on Mergers and Acquisitions, - Federal Trade Commission [2;27]. For method of computation, see text.

Table II

Merger and Estimated Cash Flow Correlations By
Two-Digit S.I.C. Code

S.I.C. Classification	Total Mergers as Parent Company Within S.I.C.	Total Mergers as Parent Company Outside S.I.C.	Total Mergers as Acquired Company Outside S.I.C.	Spearman Correlation of C_{jk} and M_{jk}
20 Food Products	77	32	13	.210
21 Tobacco	1	8	0	-.236
22 Textiles	11	11	18	-.258
23 Apparel	8	10	20	-.068
24 Lumber & Wood Prod.	17	17	29	.263
25 Furniture & Fixtures	8	7	16	-.071
26 Paper Products	19	35	10	-.014
27 Printing & Publishing	37	13	13	-.366
28 Chemicals	62	58	36	-.025
29 Petroleum Refining	0	7	4	.181
30 Rubber & Plastics	7	11	33	-.373
31 Leather Products	1	6	3	-.433
32 Stone, Clay, Glass & Concrete Products	8	38	15	.072
33 Primary Metals	14	40	23	.250
34 Fabricated Metal Products, Except Machinery & Trans.	19	55	76	-.266
35 Machinery, Except Electrical	60	55	110	-.010
36 Electrical Machinery, Equip. & Supplies	60	59	57	-.201
37 Transportation Equip.	9	56	19	.331
38 Measuring Instruments; Photographic, Medical & Optical Goods; Watches & Clocks	12	25	32	-.222
39 Miscellaneous	15	16	32	-.213

Sources: Annual Survey of Manufactures and Statistical Report on Mergers and Acquisitions, - Federal Trade Commission. [2;27] For method of computation see text.

Table III

Results of Logit and OLS

Analysis of Merger Patterns

	Variable	Coefficient	Standard Error	P-Level
Model A[a,b] p = .4805	Intercept	.826	.237	.0005
	Attraction	-.001	.001	.4805
Model B[a,c] p = .6168	Constant	1.135	.383	.003
	2nd Quintile Dummy	-.665	.505	.188
	3rd Quintile Dummy	-.237	.524	.651
	4th Quintile Dummy	-.639	.511	.210
	5th Quintile Dummy	-.555	.508	.275
Model C[b,d] p = .1099	Intercept	1.9807	.2314	.0001
	Attraction	-.0024	.0015	.1099

[a] Dependent variable is one if ratio of actual to expected number of mergers exceeds one, and zero otherwise.

[b] Causal variable is the sum of the ranks of the inter-industry cash flow view from each industry's perspective. See text.

[c] The causal variables are a set of dummies representing the quintiles of the attraction variable.

[d] The dependent variable is the ratio of actual to expected numbers of mergers, and the data is censored to exclude zero values. That procedure biases against a coefficient that departs significantly from zero. See text.

Table IV

Three-digit Classifications from Enterprise Statistics, [6].

Used in Analysis of Industrial Structure

Industry Code	Description
20G	Grain Mill Products
20J	Sugar
20K	Misc. Food & Kindred Products
22D	Floor Covering Mills
22E	Yarn and Thread Mills
22G	Women & Children's Undergarments
23J	Misc. Fabricated Textiles
24B	Sawmills & Planning Mills
24C	Millwork, Plywood, & Related Products
26B	Misc. Converted Paper Products
26C	Paperboard Containers & Boxes
27C	Books
28B	Drugs
28E	Agricultural Chemicals
28F	Misc. Chemical Products
31A	Footwear, Except Rubber
32B	Structural Clay Products
34B	Cutlery, Handtools, & Hardware
34C	Plumbing & Heating, Except Electric
34G	Screw Machine Products, Bolts, Etc.
34J	Metal Services, NEC.
35G	Special Industry Machinery
35K	Service Industry Machines
36A	Household Appliances
36B	Electric Lighting & Wiring Equipment
36D	Electronic Components & Acces.
37A	Motor Vehicles & Equipment
37D	Ship & Boat Building & Repair
38C	Medical Instruments & Supplies
38E	Watches, Clocks, & Watchcases
39A	Jewelry, Silverware, & Plated Ware

TABLE V

Analysis of the Structure of Conglomerate Firms

A. Continuous versions of variables - Pooled data (for all j)

Variable	Number of Observations	Mean	Standard Deviation Deviation
ε_{jk}	919	.0076	.0549
C_{jk}	916	.3910	.3372

Correlation: - .039 (p-level = .1155)

B. Discrete versions of variables - Pooled data (for all j)

ε_{jk}	C'_{jk} $(C^0_{jk} \leq 0)$	$(C^1_{jk} > 0)$
$\varepsilon^0_{jk} \leq 0$	89	530
	619	
	56.3%	69.7%
$\varepsilon^1_{jk} > 0$	69	231
	300	
	43.7%	30.3%
totals	158	761

$X^2 = 10.551$ (p-level = .0012)

Sources: Annual Survey of Manufacturers [2] and Enterprise Statistics [6].

Table VI

Analysis of Industrial Structure

Tables of Association Between C'_{jk} and ε'_{jk} Aggregated from Three-digit to Two-digit Level of Industrial Classification

Industry	C'_{jk} = 0	C'_{jk} = 1	ε'_{jk}
20	11	58	0
	5	13	1
22	12	38	0
	5	5	1
23	12	30	0
	6	12	1
24	3	37	0
	3	17	1
26	7	29	0
	4	20	1
27	2	24	0
	1	4	1
28	5	48	0
	3	30	1
31	1	23	0
	2	5	1
32	4	24	0
	1	2	1
34	8	61	0
	8	35	1
35	3	29	0
	7	21	1
36	12	48	0
	6	21	1
37	16	26	0
	6	12	1
38	3	42	0
	3	12	1
39	4	20	0
	0	6	1

Table VII

Results of Logit Analysis

of Structure Data

	Variable	Non-zero Interval	Coefficient	Standard Error	P-Level
Model A[a,b] p = .1230	Intercept	-	-.657	.108	.000
	Correlation	-	-.316	.204	.123
Model B[a,b,c] p =	Intercept	-	-1.451	.233	.000
	Correlation	-	-.134	.214	.532
	Concentration	-	.021	.005	.000
Model C[a,d] p =	Constant	all	-.350	.199	.079
	C2	$-1<C\leq.1$	-.585	.321	.069
	C3	$.1<C\leq.3$	-.392	.337	.244
	C4	$.3<C\leq.6$	-.542	.232	.019
	C5	$.6<C$	-.441	.235	.061
Model D[a,d,c] p =	Constant	all	-1.256	.305	.000
	C2	$-1<C\leq.1$	-.397	.330	.229
	C3	$.1<C\leq.3$	-.238	.347	.493
	C4	$.3<C\leq.6$	-.304	.243	.213
	C5	$.6<C$	-.217	.248	.381
	Concentration	-	.021	.005	.000

[a]The dependent variable is one if ε_{jk} exceeds zero, and zero otherwise.

[b]The causal variable is the correlation between returns to the pair of industries.

[c]The concentration measure is a four firm ratio based on sales.

[d]C2-C5 are dummies taking the value of one if correlation is in the indicated range, and zero otherwise. The resulting proportions in the order (Constant, C2-C5) are (.10, .09, .08, .39, .34).