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Diversification, Ricardian rents, and Tobin's *q*

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According to prevailing theory, firms diversify in response to excess capacity of factors that are subject to market failure. By probing into the heterogeneity of these factors, we develop the corollary that firms that elect to diversify most widely should expect the lowest average rents. An empirical test, with Tobin's q *as the measure of rents, is consistent with this theory.*

1. Introduction

■ It is beyond dispute that multimarket firms play a dominant role in modern society. Despite this, economic analysis does not have a great deal to say about firm diversification, and the theory that does exist is largely untested.[1]

The prevailing theory of diversification (e.g., Caves, 1971; Gorecki, 1975; Penrose, 1959; Teece, 1982) is based on excess capacity of productive factors. It argues that failure in the markets for these factors may make diversification an efficient choice, although the factors are expected to lose some efficiency in the transfer. In this article we attempt to extend this theory by considering the heterogeneity of factors that prompts diversification and the profit-maximizing decisions made by diversifying firms.

In Section 2 we discuss the nature of rents and argue that Ricardian rents may be appropriated by owners of inimitable factors, or by their trading partners if relationship-specific investments tie the parties together. After characterizing these factors, in Section 3 we consider different utilization patterns and their profit implications. In general, we assume that application in a firm's current domestic or foreign markets should be the most profitable. If these applications leave excess capacity, however, diversification then becomes a viable choice. At this juncture, the specificity of the factor and the nature of the firm's diversification opportunities become important. In particular, one would expect that the more widely a firm diversifies, the lower will be its average rents. Two points support this argument: first, wider diversification suggests the presence of less specific factors that normally yield less competitive advantage; second, a given factor will lose more value when transferred to markets that are less similar to that in which it originated.

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[1] See Caves, Porter, and Spence (1980) for some of the most careful work and further references.

In Section 4 we introduce Tobin's q and show how Ricardian rents will be reflected in this measure of firm performance. Section 5 contains our data and measures. Section 6 gives the empirical results using Tobin's q to test the hypothesis that rents decrease as large firms diversify more widely. A summary and suggestions for future research appear in Section 7.

2. Sources of Ricardian rents

■ Firms earn rents for many reasons, and there are several ways to classify such rents. Rents can result from collusive relationships with competitors, from disequilibrium effects (luck), and from unique factors. The last class will be called Ricardian rents and is the focus of this article.[2]

Economic or Ricardian rents are ordinarily thought of as accruing to *owners* of unique factors. A firm could, for example, earn Ricardian rents if it is owned and operated by a good manager,[3] if it owns attractively located land, or if it holds a patent. As highlighted by Lippman and Rumelt (1982), a firm may also earn rents if it owns factors subject to uncertain imitability, such as the rights to a reputable brand name or a reputation for fairness (cf. Kreps, 1984). Although competitors could invest in developing comparable reputations, this may be an uncertain project. In such cases the firm may continue to earn rents although, in principle, the factor is imitable. On the other hand, a firm cannot earn rents just by employing a good manager or taking a license on a brand name since the price of these services will be bid up to the point where all rents accrue to the factor owners.

We suggest that Ricardian rents from the factors a firm owns are only part of the story. Firms also may appropriate substantial rents as trading partners of factor owners, provided that relationship-specific investments tie the parties together.[4] In such cases we shall say that the firm *shares* the factor in question. For example, if a firm employs a team of managers with superadditive productivity, the firm may appropriate some of the rent the team earns because the managers have difficulty marketing themselves as a package.[5] As another example, the firm may employ a manager or use a supplier who makes unanticipated investments that cement the trading relationship by creating switching costs.[6] Because of laws against slavery, this is the only way a publicly held corporation can appropriate rents from human factors.

3. Diversification as a way to appropriate Ricardian rents

■ Let us now assume that a firm owns or shares a factor that has excess capacity and can be used beyond the firm's current scope. In such circumstances it is important to consider the patterns of utilization that will allow the firm to extract maximum rents.

If the factor is subject to market imperfections, the firm may decide to use the capacity internally instead of selling or renting it in an imperfect factor market. According to standard theory, these circumstances lead to diversification (Williamson, 1985).

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[2] Lindenberg and Ross (1981), Salinger (1984), and Smirlock, Gilligan, and Marshall (1984) have studied rents resulting from collusive and disequilibrium effects, which will be incorporated in the present analysis as control variables.

[3] It is obviously possible to impute the rent of the owner-manager to the person rather than the firm, but this difference is immaterial for our purposes.

[4] In related literature Nelson and Winter (1982) stress team effects and von Weizsäcker (1984) analyzes the effects of switching costs.

[5] Again, here it is possible to attribute the rents to the ownership of the employment contracts, etc. Such semantic exercises may not be the best way to make progress in this area, however.

[6] If the process is anticipated, provisions for allocating the switching costs will be contracted for *ex ante*. See Klein, Crawford, and Alchian (1978).

To simplify the argument we make four important assumptions. First, we abstract from the indivisibility problem emphasized by Penrose (1959) by assuming that the firm can dispose of excess capacity (sell it at price zero) without affecting the rest of its operations. Second, we do not consider cases where there are natural economies of scope between two industries such that any firm in one industry will participate uniformly in the other. In effect, we shall look at such pairs of industries as a single industry. Third, we concentrate on firms that own or control rent-yielding factors, not firms that lack access to such factors. Fourth, for maximum transparency we conduct the analysis in a static model and evaluate the case of a single diversification move in which a firm with excess capacity of a rent-yielding factor considers a marginal expansion of its scope.[7] While these assumptions abstract from reality, we shall demonstrate that a theory consistent with the data can be built around them.

With respect to a marginal change in the scope of the firm, the givens are a set of factors and a list of markets to which they may be transferred and result in smaller or greater competitive advantages. Let us define that market in which the factor will yield the highest rents as the "closest." Further, let us think of the distance to that market as larger to the extent that the critical factors in the market differ from those in the firm's current scope. The more a firm has to diversify, i.e., the farther from its current scope that it must go, *ceteris paribus,* the larger will be the loss in efficiency and the lower will be the competitive advantage conferred by the factor.

Accordingly, if a firm diversifies, it will transfer excess factors to the closest market it can enter. If excess capacity remains, it will enter markets even farther afield, until marginal rents become subnormal. A firm whose opportunity set is such that it must transfer a great deal of excess capacity to a distant market will realize low marginal rents. Therefore, the value of the original set of factors, and thus the total value of the firm, will, *ceteris paribus,* depend negatively on the optimal extent of diversification.

Of course, all things are not equal, and one important way firms' factors may vary is in their specificity. We define less specific factors as those that lose less efficiency as they are applied farther from their origin. (See Figure 1.) These factors will normally yield less advantage because they are in wider supply. Our argument here is that many firms have the opportunity to develop factors that apply in many industries (e.g., teams of general managers), whereas fewer firms have natural opportunities to create more specific factors (e.g., teams of biochemists). Because less specific factors normally support wider diversification, their relatively lower value will tend to strengthen the negative relationship between the extent of diversification and average rents.[8]

In summary, given the specificity of a set of factors, the optimal decision for a firm is to apply its excess capacity to the closest entry opportunity. The rent the firm can extract from the move depends on the specificity of the factors and the closeness of the new market. These conditions result in the following stylized relationships:

(a) Firms with less specific factors and nearby entry opportunities will diversify narrowly and extract medium rents on average.
(b) Firms with more specific factors whose closest entry opportunities are in "nearby" markets will diversify narrowly and extract high rents on average.

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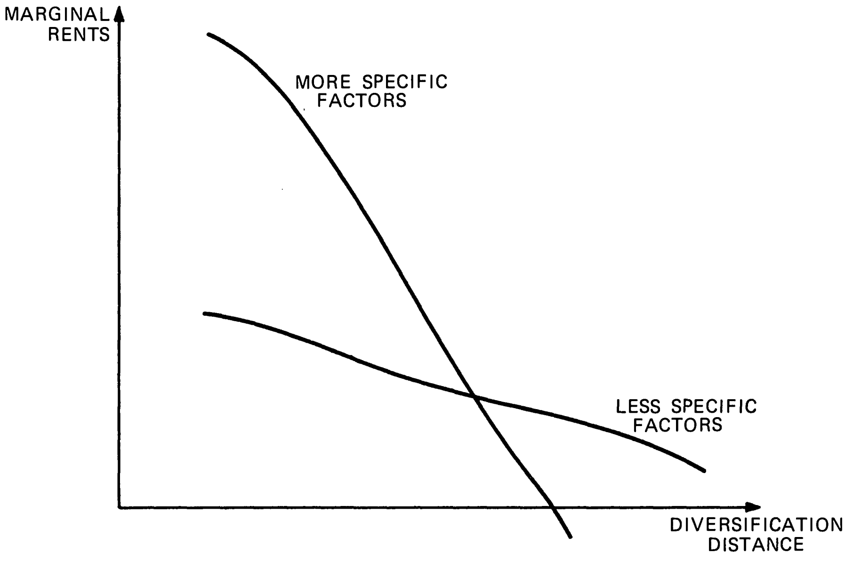
[7] In cases where the underlying factor is intangible, it often does not obey the law of conservation, and a single instance of excess capacity can lead to several diversification moves. For example, reputations or information may have almost infinite capacity. Even in these instances, however, the basic building block is the individual diversification move.

[8] An additional problem for firms with less specific factors is that such factors alone are insufficient to allow the firm to enter industries where more specialized factors are required. Accordingly, one would expect that the industries these firms enter will have a high concentration of firms competing with less specific factors, and no firm will have a major differential advantage.

FIGURE 1

HYPOTHESIZED RELATIONSHIP BETWEEN DIVERSIFICATION DISTANCE AND MARGINAL RENTS FOR DIFFERENT DEGREES OF FACTOR SPECIFITY



(c) Firms with less specific factors that have only quite "distant" opportunities will diversify widely and extract low rents on average.
(d) Firms with more specific factors and no nearby entry opportunities will not be able to diversify at positive marginal rents. Because the factors are more specific, they should yield high rents in those markets. Further, the fact that these firms do not make additional investments at lower marginal rents will preserve the high average. In sum, these firms are likely to have very high *average returns,* although it is clear that their *total profits* would increase if they had opportunities to diversify.

This reasoning, illustrated in Figure 2, allows us to predict that as optimal diversification increases, average rents decline.

The prediction that undiversified firms earn the highest average rents is quite sensitive to our assumptions. First, if unused excess capacity imposes a cost on the firm, the analysis of case (d) would have to be modified to net this out. Second, if firms diversify owning to natural economies of scope that affect all participants in their industries, their performance should resemble that of undiversified firms. If this is a common phenomenon in our sample, case (d) will be less exceptional. Third, if a firm owns or controls few or no rent-yielding factors, our conclusions will not apply. Given that our analysis concentrates on very large firms, this third caveat should not be relevant.

4. Tobin's *q* as a measure of rents

■ The use of accounting measures as a proxy for rents has recently come under severe criticism (Benston, 1985; Fisher and McGowan, 1983). In particular, accounting rates of return are distorted by a failure to consider differences in systematic risk, temporary disequilibrium effects, tax laws, and arbitrary accounting conventions. Instead, it is recommended that one rely on the hypothesis of an efficient capital market to get unbiased measures of capitalized rents. For practical purposes, however, pure-capital-market measures capture only changes in firm value, not levels of value. For this reason, our main hypothesis—that more widely diversified firms *ceteris paribus* earn lower rents—cannot easily be tested on pure-capital-market data. If the hypothesis is true, an efficient capital market will already

FIGURE 2

HYPOTHESIZED RELATIONSHIPS BETWEEN SPECIFICITY OF FACTORS IN EXCESS CAPACITY, CLOSEST ENTRY OPPORTUNITY, AND EXTRACTED AVERAGE RENTS

		FACTOR SPECIFICITY	
		LOW	HIGH
CLOSEST ENTRY OPPORTUNITIES	NEARBY	(a) MEDIUM DIVERSIFICATION, MEDIUM AVERAGE RENTS	(b) NARROW DIVERSIFICATION, HIGH AVERAGE RENTS
	DISTANT	(c) WIDE DIVERSIFICATION, LOW AVERAGE RENTS	(d) NO DIVERSIFICATION, VERY HIGH AVERAGE RENTS

have incorporated the diversification effect in share prices, and later observations would not reveal differential changes in value creation.

For our purposes, Tobin's q, defined as the ratio of market value to the replacement cost of the firm, is a more appropriate measure. By combining capital market data with accounting data, q implicitly uses the correct risk-adjusted discount rate, imputes equilibrium returns, and minimizes distortions due to tax laws and accounting conventions. Although originally introduced in macroeconomics, these attractive properties have recently given q increasing use in industrial organization research (Lindenberg and Ross, 1981; Salinger, 1984; Smirlock *et al.,* 1984). In this article the use of q is especially attractive since firms with different diversification profiles have been found to concentrate in different industries (Caves *et al.,* 1980, chap. 12; Lecraw, 1984). Therefore, to minimize industry-related biases, it is important that we control for systematic risk, disequilibria, tax laws, and accounting conventions that tend to vary much more across industries than within them.

In principle, the numerator in q can be decomposed into the sum of the firm's capitalized income streams. While many decompositions are possible, the literature (Lindenberg and Ross, 1981; Salinger, 1984; Smirlock *et al.,* 1984) suggests that we decompose the market value of the firm into the value of its physical assets, the value of its intangible assets, the capitalized rents from collusive relationships, capitalized Ricardian rents, and, possibly, disequilibrium effects.

As defined, the denominator of q is the replacement cost of a firm's assets. In practice, this has come to mean the replacement value of a firm's physical assets. The extent to which q differs from one is thus a measure of the extent to which the firm's capitalized rents differ from the fair market price of its physical assets.

From this, we can write q as

$$q = M/V_p = 1 + (V_I + V_C + V_R + V_E)/V_p, \tag{1}$$

where

M = the market value of the firm;
V_p = the (replacement) value of physical assets;
V_I = the value of intangible assets purchased by the firm;
V_C = the value of collusive relationships with competitors;
V_R = the capitalized Ricardian rents; and
V_E = disequilibrium effects.

We estimate (1), using the conventional proxies for V_I, V_C, and V_E, so that we may focus on the relationship between V_R and multimarket activity. This relationship, however, is not straightforward. If we denote d as diversification, s as specificity, and o as opportunities, our theory is that V_R/V_p is an increasing function of s and a decreasing function of d, while d is a decreasing function of s and an increasing function of o. Formally,

$$\frac{V_R}{V_p}(s, d) \qquad (2)$$

$$d(s, o). \qquad (3)$$

A problem is that s and o are unobserved. We propose to solve this problem by using a set of industry dummies as an instrument for d in

$$\frac{V_R}{V_p}(d). \qquad (4)$$

This amounts to using the average industry-level diversification, rather than each firm's own diversification level, as a proxy for s and o. Given that (2) and (3) are likely to be underspecified, (4) is of course subject to the usual errors-in-variables problem.

5. Data, measures, and tests

■ Lindenberg and Ross (1981) generously shared their estimates of 1976 q for a random sample of 246 firms. Trinet/EIS provided 1976 domestic market share data and dollar sales per four-digit SIC code (*EIS Establishment Database*). 1976 replacement cost data are from 10 K's, and foreign sales estimates (available only for 1978) are from the *EIS Directory of Top 1500 Firms.* Industry estimates of marketing expenditures and company sponsored R&D are from the *1976 Line-of-Business Report,* published by the Federal Trade Commission. Four-firm concentration ratios for 1977 and 1972–1977 growth rates per SIC code are from the *1977 Census of Manufactures.* Missing data reduced the sample size to 167.

From these data we can construct estimates of the following variables:

A_i = firm i's marketing expenditures (sales weighted);[9]
R_i = firm i's R&D (sales weighted);
C_i = concentration in firm i's markets (sales weighted);
G_i = growth of shipments in firm i's markets (sales weighted);
S_i = firm i's market share (sales weighted);
F_i = firm i's foreign sales (in percent); and
V_{pi} = replacement costs of firm i's physical assets.

The diversification measure requires more explanation. Several measures have been used in the literature, and, while they typically correlate very strongly (Caves *et al.*, 1980, p. 201), they still are not the same. In particular, we want to differentiate between more and less similar diversification. While a categorical measure, such as that used by Lecraw (1984), is a possibility, we felt that we would lose too much information with such a procedure. Instead, we chose the "concentric index" of Caves *et al.* (1980), given by

$$D_i = \sum_{j=1}^{n} m_{ij} \sum_{l=1}^{n} m_{il} r_{jl},$$

[9] Firm-level estimates for marketing and R&D expenditures are derived by weighing industry-level data, and thus rest on the assumption that a firm's spending per market is approximately equal to the industry average. Direct firm-level estimates were obtained from Compustat for 75 of the 167 firms. These correlated with our estimates at the .811 and .765 level, respectively. On the other hand, the Compustat data lacked surface validity: in addition to the many entries labeled as "missing," a number of observations showed zero-levels of spending, e.g., zero advertising dollars for Chrysler.

where m_{ij} is the percentage of firm i's sales in industry j, and r_{jl} is zero if j and l have the same three-digit code, one if they have different three-digit codes but identical two-digit codes, and two if they have different two-digit codes.

For instruments for D_i, we use vectors of dummy variables $t_i = (t_{i20}, t_{i21}, \ldots, t_{i39})$, where t_{ij} is one if firm i is active in two-digit industry j, and otherwise zero.[10] The results of King (1966), Farrell (1974), and Livingston (1977) show few variations in returns within (but large variations between) two-digit industries; thus, we do not expect to lose much information by operating at this level of aggregation. Further, an advantage of the aggregation is that it diminishes the endogeneity problem.

From this, we estimate two equations

$$q = \beta_0 + \beta_1 \frac{A}{V_p} + \beta_2 \frac{R}{V_p} + \beta_3 C + \beta_4 S + \beta_5 D + \beta_6 F + \beta_7 G + \epsilon \tag{5a}$$

$$q = \beta'_0 + \beta'_1 \frac{A}{V_p} + \beta'_2 \frac{R}{V_p} + \beta'_3 C + \beta'_4 S + \beta'_5 \hat{D} + \beta'_6 F + \beta'_7 G + \epsilon', \tag{5b}$$

where $\hat{D}$ indicates that D is estimated through the instruments.

In these equations β_0 should be roughly one, the value of q under perfect competition, since in that case the other terms will all be zero. The coefficients of purchased intangible assets, β_1 and β_2, correct for the fact that such costs are omitted from the denominator of q. We use the 1976 values of advertising and R&D as measures of the rate at which such assets are purchased. If these rates are constant and we apply depreciation rates of .3 and .1, respectively (as done by Salinger (1984) and originally recommended by Grabowski and Mueller (1978)), the stocks of the intangibles should be 10/3 and 10 times the 1976 inflows. If the value of the stocks is unity, β_1 and β_2 should therefore be roughly 10/3 and 10, respectively.

Predictions about concentration (β_3) and market share (β_4) depend on one's beliefs about the structure-conduct-performance paradigm versus the "efficient-structure" hypothesis. If the results of Smirlock *et al.* (1984) extend to our sample, β_3 is unlikely to be significantly different from zero, while we would expect a positive β_4, an indication of Ricardian rents.

On the basis of arguments outlined in Section 3, we clearly expect the coefficient of diversification (β_5) to be negative. The more widely a firm diversifies, the lower will be its average returns.

The coefficient of foreign sales (β_6) is harder to assess. If foreign markets are nearly identical to domestic markets, sales in those markets should have the same effect as higher market share, and β_6 will be positive, which reflects Ricardian rents. On the other hand, if foreign markets differ enough that the firm's factors face significant efficiency losses in the transfer, β_6 will be negative. It is likely that both kinds of markets are represented in our sample, which makes it difficult to predict the sign. A further complication is that foreign assets are outside the requirements of replacement-cost accounting so that q normally will be biased upwards for firms with substantial foreign assets. Finally, we expect the coefficient of industry growth, β_7, which captures disequilibrium effects, to be positive (see also Salinger, 1984).

Because both sides of (5) are divided by V_p, measurement error in this variable induces some problems. We therefore follow Griliches (1981) and take logs, using the $x \approx \log(1 + x)$ approximation, to get

[10] We are indebted to a referee for suggesting this instrument.

$$\log M = \gamma_0 + \gamma_1 \log V_p + \gamma_2 \frac{A}{V_p} + \gamma_3 \frac{R}{V_p} + \gamma_4 C + \gamma_5 S + \gamma_6 D + \gamma_7 F + \gamma_8 G + e \qquad (6a)$$

$$\log M = \gamma'_0 + \gamma'_1 \log V_p + \gamma'_2 \frac{A}{V_p} + \gamma'_3 \frac{R}{V_p} + \gamma'_4 C + \gamma'_5 S + \gamma'_6 \hat{D} + \gamma'_7 F + \gamma'_8 G + e', \qquad (6b)$$

which we also estimate.

6. Results

■ The first line in Table 1 is equation (5a), the linear form estimated without using instruments for D. Note first that the adjusted R^2 is similar to that of other studies of this type (Salinger, 1984). As expected, the intercept is not significantly different from one, and the coefficients of A/V_p and R/V_p are not significantly different from 10/3 and 10, respectively.[11] Market share (S) has a positive coefficient, while concentration (C) has a negative effect. These results indicate that large firms in otherwise fragmented industries reap high Ricardian rents, a result that is consistent with the findings of Smirlock *et al.* (1984). As expected, the coefficient on diversification (D) is negative and significant.[12] As firms diversify more widely, their average rents decline. Let us emphasize that this does not mean that diversification conflicts with value maximization. A firm's marginal investments should still have a q that exceeds one, even where this q is below the average q of the firm's other activities. The coefficient of foreign sales (F) is positive. This would indicate that for most of our firms foreign sales are more similar to domestic sales than to diversification (although it is difficult to evaluate the positive bias alluded to in Section 5). Finally, it is somewhat surprising that industry growth is insignificant, given that Salinger (1984) typically finds this to be the strongest coefficient.

The second line in Table 1 is (5b), the linear form estimated by using the industry dummies as instruments for D. The coefficient of $\hat{D}$ is somewhat larger than that of D, and the adjusted R^2 for this equation is virtually identical to that of (5a). Overall, however, the results are quite similar, which indicates that the possible bias from treating D as exogenous is small.

The third and fourth lines in Table 1 are (6a) and (6b), the logarithmic forms without and with the instruments, respectively. The overall behavior of the model is essentially unchanged, although neither the coefficient of D nor that of $\hat{D}$ is significant in these versions. The positive correlation between D and V_p presumably explains the larger coefficients of diversification in these models.

7. Discussion

■ Using Tobin's q, we have tested the conjecture that large firms earn decreasing average rents as they diversify more widely. Our findings are consistent with the idea that diversification is prompted by excess capacity in rent-yielding factors that are subject to market failure. More specifically, our results indicate that the farther they must go to use their factors, the lower the marginal rents they extract.

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[11] In addition, we know from many studies (e.g., Caves *et al.*, 1980) that there is a strong correlation between R&D and diversification. We also estimated the model without R&D, and no significant results changed.

[12] In another article (Wernerfelt and Montgomery, 1988), we compared the importance of industry, diversification, and market share effects in explaining q. Industry effects explain 20–30% of the variance, while diversification effects account for roughly 3% and market share is insignificant.

TABLE 1 **Regression Results: Firm Value of Extent of Diversification***

Dependent Variable	I	$\log V_p$	A/V_p	R/V_p	C	S	D	$\hat{D}$	F	G	$\bar{R}^2$
q	.908		2.71	8.98	−.006	1.01	−.145		.417	.007	.293
	(5.88)		(4.70)	(3.36)	(2.44)	(2.35)	(1.97)		(1.84)	(.091)	
q	.888		2.52	9.33	−.006	1.13		−.186	.469	.008	.296
	(5.67)		(4.08)	(3.28)	(2.17)	(2.51)		(2.20)	(1.93)	(.086)	
$\log M$	−.728	1.03	2.23	9.47	−.006	.846	−.035		.273	.024	
	(1.83)	(35.4)	(4.12)	(4.05)	(2.57)	(1.93)	(.538)		(1.32)	(.302)	
$\log M$	−.926	1.05	2.24	9.92	−.005	.714		−.139	.281	.011	
	(2.12)	(32.0)	(3.93)	(3.99)	(2.27)	(1.55)		(1.76)	(1.29)	(.133)	

* t-statistics in parentheses. N = 167 for all equations.

The issue of alternative explanations remains. Focusing on equation (5a), we could explain the negative relationship between market valuation and diversification by other theories. First, as suggested by a referee, there is a possibility that at some point firms believed that rents from diversification would be gained more easily than history has borne out. As experience and information to the contrary reached the market, stock prices of diversified firms may have fallen to reflect these errors in judgment. Second, Jensen's (1986) "free-cash-flow" hypothesis implies that firms with available cash undertake diversification against the interests of stockholders. Third, one can offer various agency-theoretic arguments to the effect that firms diversify to overcome severe moral-hazard problems.

The fact that the industry dummies worked so well as instruments for diversification provides an argument against the first and third of these theories. It is eminently reasonable that asset specificity is homogeneous within industries. It is less reasonable that beliefs about the profitability of diversification, and the incidence of specific types of agency problems, should follow industry lines as sharply as our results indicate. The "free-cash-flow" hypothesis is more difficult to rule out, although it need not be inconsistent with our story. We envision a firm (Section 3) as having a queue of potential diversification opportunities. We argue that a firm, in electing to diversify, will begin with the most profitable opportunities and move toward the least profitable ones. Our expectation is that this process will end when marginal rents become subnormal. In the free-cash-flow view one could expect firms to pursue investments beyond this point.

The study has several limitations. On the theoretical side, we made several simplifying assumptions. In particular, we assumed that disposal of excess capacity is costless and that natural economies of scope, affecting all firms in a pair of industries, do not exist. As discussed in Section 3, these assumptions are important for our prediction about the performance of undiversified firms; without them, one might expect that closely diversified firms may earn even higher average rents. Although more complex theories may highlight other dimensions of the problem, these assumptions allow us to focus on a few key implications of factor heterogeneity and are sufficient to explain the evidence. On the empirical side, it is worth noting that the study pertains only to large, successful firms. As discussed in Section 3, the theory is not expected to extend to small competitive firms. Finally, we would like to reémphasize that both theory and tests refer to average rents, not total profits.

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