UNION RENT SEEKING, INTANGIBLE CAPITAL, AND MARKET VALUE OF THE FIRM

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Abstract—This study considers the effect of unions on intangible capital investment and profitability within the context of a market value rather than a more traditional accounting based approach. Theory is provided suggesting unions are able to affect profitability by sharing in the economic returns to firm-specific intangible capital. In support of this hypothesis, we find unionization reduces the returns to R & D, and produces a corresponding limiting influence on R & D investment at the firm level.

I. Introduction

An extensive literature in economics has examined the determinants of profitability, with much of the focus centering on the role of market structure. Only recently, however, have the effects of labor unions on profitability been analyzed. This is surprising since labor economists long have emphasized union influences on wages and productivity that in turn may affect profitability.[1] In recent studies, Freeman (1983) and Karier (1985) report a significant limiting influence of unions on price–cost margins in high concentration manufacturing industries. Using firm-level data and the market-based Tobin's q measure of profitability, Salinger (1984) also concludes that unions effectively capture monopoly profits associated with higher concentration. In contrast, Clark (1984) finds accounting rates of return on sales and capital are reduced most significantly by unions in product-lines having *low* market shares. These studies, however, have not examined other potentially important routes through which unions might influence profitability.[2]

In this paper, the returns due to firm-specific factors are viewed as especially vulnerable to union capture to the extent that the sources of these rents are not transferable across firms. That is, since contracts which license others to produce and share in the revealed proprietary advantages of rent-earning firms can be costly to monitor and enforce, firms will maintain "own" production and share rents with unionized employees when this sharing is less costly than contract monitoring and enforcement.

Section II examines the manner in which unions may affect firm profitability, and presents our model of union rent seeking. Here, we offer research and development (R & D) as an example of an intangible capital asset whose returns are vulnerable to union rent seeking. We also discuss the role of "efficient contracts" in minimizing the allocative effects of successful union rent seeking. In section III, we specify, estimate, and test hypotheses derived from our model and measure union effects on market value and R & D investment. Conclusions and implications for future research are presented in section IV.

II. Union Rent Seeking and Market Value of the Firm

A. Unions and Profitability

A traditional view of unions is that they act as monopoly providers of labor and use this power to obtain compensation above that in the nonunion sector. Supercompetitive union wages are possible when members share in any firm returns to market power or Ricardian advantages. In response to union wage gains, the firm adjusts upward along its labor demand schedule, hiring fewer and, in the long run, more able workers. *Ceteris paribus*, profitability for the unionized firm will unambiguously decrease since the union has increased labor costs,

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[1] Lewis (1986) surveys the empirical literature on union wage effects, while Freeman and Medoff (1984, chs. 11–12) and Hirsch and Addison (1986, ch. 7) survey literature examining union effects on productivity and profits.

[2] Hirsch and Connolly (1985) challenge the conclusion that unions capture profits associated with concentration. Their skepticism is based on the fragility of econometric results and the absence of corroborative labor market evidence. Other U.S. studies examining union effects on profits include Voos and Mishel (1986) and Ruback and Zimmerman (1984).

yet not made available any additional production alternatives (industry-wide unionization, of course, can reduce output and increase product prices).

This scenario assumes wage–employment outcomes on the labor demand curve. However, there exist "efficient" bargaining outcomes off the demand curve, with lower wages and greater employment, preferred by both the union and firm (McDonald and Solow, 1981; MaCurdy and Pencavel, 1986). To obtain such outcomes, the union and firm must bargain simultaneously over wages and employment, and be able to enforce any implicit or explicit agreement. Joint wage–employment bargaining typically produces less allocative inefficiency than sequential wage and employment determination on the labor demand curve, but profits will decrease relative to the nonunion outcome.[3]

Of course, decreases in profitability due to union bargaining success will be reinforced by any negative influence of unions on technical efficiency. Union work rules, decreased management flexibility, and reduced work incentives (due, say, to less merit-based wage dispersion) all have the potential to increase costs, although such cost increases can be mitigated by improved organization, increased monitoring, and a greater formalization of worker-management relations.

Alternatively, unions can increase profitability if they engender large increases in labor productivity. Freeman and Medoff (1984), among others, have provided theory and summarized evidence suggesting that unions increase labor productivity in many, although not all, work settings. Unions, it is argued, provide an internal "collective voice" that serves as a substitute for external voice by exit (quits). In work settings characterized by public goods (e.g., job safety, job governance structures) and significant worker complementarities, union representation of "average" rather than "marginal" workers (as predicted by the median voter model) *may* increase efficiency.

Even where unions increase labor productivity significantly, however, it does not follow that firm profit rates will increase. Indeed, the relationship among labor productivity, unit costs, and the rate of return on capital is rather complex (for details, see Clark (1984)). The overall effect of unions on profitability, therefore, is an open and interesting empirical question.

B. Union Rent Seeking and Intangible Capital

The source of union wage gains is an important unresolved issue. Union rent seeking is likely to be most successful where bargaining firms enjoy above-normal returns due to market power or Ricardian advantages, since these returns can be shared even in long-run equilibrium. While it is generally believed that the profit target is larger among firms with greater market shares or in more concentrated industries, the sources of above-normal returns may relate more to firm-specific factors than to the size distribution of competitors (Hirschey, 1985). It is therefore not surprising that studies considering the effects of market structure on the union-profitability relation produce inconclusive results (see Hirsch and Connolly, 1985).

While the effects of market structure on union success in bargaining have received attention in the literature, the potential effects of Ricardian rents, related to firm-specific factors which lower costs or increase output quality, have been largely ignored. As in the case of durable capital (see Baldwin, 1983), specialized production capabilities generate rents which are vulnerable to capture.[4] For example, trade secrets which give rise to production advantages and above-normal returns seldom can be transferred or licensed without economic risk. Contracts can be designed to ameliorate the problem of stolen trade secrets, but the expense of contract monitoring and enforcement may provide firms with a greater incentive to accede to union wage demands to protect proprietary information.

[3] For example, one outcome is that settlements occur on a vertical contract curve, formed by the tangencies of the union's indifference and the firm's isoprofit curves, so that nonunion quantities of labor and capital are employed. In this case, the union decreases profits, but no static inefficiency occurs as a result of the union.

[4] Baldwin (1983) analyzes the case of an industry with a large sunk-cost technology whose capital replacement cycle is long relative to the union's time horizon. If its durable capital is specialized, unions will have an incentive to demand higher wages as a means of expropriating some of the returns, while capital owners may have short-run incentives to acquiesce (as opposed to, say, letting a plant stand idle during a strike). Because capital vulnerability decreases the expected return on investment, Baldwin suggests that the firm will decrease new capital formation as a means of discouraging higher future wage demands.

R & D provides an interesting example of intangible capital, the returns to which may be susceptible to union rent seeking. The extent to which a firm's returns on R & D investment are vulnerable will depend on many influences including the union's bargaining power, the nature of the firm's production process, the firm's ability to license product and process innovations, and possibly the relative time horizons of R & D returns and union members.[5] Among these factors, patents and the patentability of R & D output play an important role. As is well known, much useful output of R & D programs does not lead directly to patents, while the value of patents themselves sometimes is diminished by the types of information which must be revealed in the patenting process. Many product or process innovations are never patented because of concerns over maintaining the advantages of proprietary information and the difficulty of doing so under current patent law and practice.

Therefore, the extent to which R & D returns are vulnerable to union sharing will depend not only on union power, but also on the extent to which important inventions or innovations can be patented. Valuable unpatented R & D output increases firm vulnerability to union sharing in R & D returns but greater labor costs may be offset by still greater information retention advantages to proprietary production. Conversely, patent protection reduces firm vulnerability to union sharing in the returns to R & D since the market for patents allows firm-to-firm transfers of these intangible assets at maximum (nonunion) values. This assumes that union firms not only have the potential to license to nonunion or foreign firms but also that unions cannot organize quickly wherever licensed technology or rents occur.

We hypothesize that unpatented R & D investments will add less to the market value of a union firm than an otherwise similar nonunion firm. On the other hand, given an efficient market for patents, we anticipate no limiting effect of unions on the returns to patented R & D output. In response to effective union capture of vulnerable rents, we expect firms to reduce their R & D spending.[6]

C. *Unions, Market Value, and R & D*

The market value of the firm is the discounted value of expected future cash flows and embodies the effects of both tangible (plant, equipment, etc.) and intangible (market power, R & D capital, etc.) factors. Thus,

$$MV(F) = MV(T) + MV(I) \tag{1}$$

where $MV(F)$ is the market value of the firm and $MV(T)$ and $MV(I)$ are market values of tangible and intangible assets, respectively (Hirschey and Wichern, 1984). The market value of tangible and intangible assets is a function of the expected earnings stream, risk-adjusted discount rate, and capital stock decay rate.

Comanor and Wilson (1967) have argued that intangible capital has a high discount rate because of risk, and a faster decay rate than does tangible capital since intangible capital seldom involves easily marketable assets with well-defined property rights. Firm expenditures to protect intangible capital (e.g., trade secrets) will be made so long as marginal protection costs are less than the marginal returns to protection. Whereas both union and nonunion firms bear property right enforcement costs in the face of external pressures, unionized firms must bear additional costs to protect intangible capital returns from *internal* capture by the union. These enforcement costs may take the form of direct payoffs or be associated with the adoption of costly implicit or explicit contract provisions which make labor's in-

[5]A union has a limited time horizon given that neither members nor leaders generally have proprietary rights in the union or the firm. Thus, it is possible that the expected payoff period for some R & D investments will be longer than union members' expected remaining work life (or, of greater relevance, union members with median preferences).

[6]The foregoing discussion assumes that efficient contracts, making the union's interests incentive-compatible with those of the firm, do not obtain (this point is developed subsequently). Because of space constraints, we do not discuss other routes through which unions affect R & D investment. For example, with imperfect capital markets, it may be difficult to finance intangible capital investments so any profit reduction due to unionism will reduce the ability to finance R & D. An additional route is the relative price effect: an increase in the wage rate is likely to alter the optimal factor mix, including inputs of R & D. Finally, because alternative R & D investment paths differ in their vulnerability to rent seeking, unions will affect the type of R & D projects undertaken.

terests incentive-compatible with those of the firm.[7]

We therefore argue that the unionized firm will bear enforcement costs, $EC(I)$, above those borne by a nonunion firm, in order to maintain its claim on rent-producing intangible capital against union pressure. Symbolically,

$$EC(I) = f[MV(I)] \tag{2}$$

where $f' > 0$. The firm will bear marginal enforcement costs so long as they are less than the marginal loss from rent sharing. Thus, voluntary sharing with labor, $VS(I)$, of intangible capital returns is

$$VS(I) = g[MV(I)] \tag{3}$$

where $g' > 0$ represents the marginal sharing cost or union "tax" on intangible capital returns. For a given level of intangible capital investment, profit maximization requires that the firm minimize the sum of enforcement and sharing costs, or

$$\text{Min}\,[EC(I) + VS(I)]. \tag{4}$$

While a unionized firm must bear costs $EC(I) + VS(I)$, a nonunion firm must bear a cost, C, to prevent unionization of the work force. The firm will resist union organizing so long as

$$C < EC(I) + VS(I). \tag{5}$$

That is, if the cost of union avoidance is less than the sum of enforcement and sharing costs of union rent seeking, nonunion status will be retained; otherwise, not.

The market value difference between union and nonunion firms, *ceteris paribus*, will be

$$MV(F)_u - MV(F)_{nu} = C - EC(I) - VS(I) < 0 \tag{6}$$

where $MV(F)_u$ and $MV(F)_{nu}$ are market values of union and nonunion firms, respectively. This difference is a function of the level of intangible capital investment and enforcement and sharing costs, mitigated by savings on union avoidance costs. Our simple model predicts unambiguously that owing to enforcement and sharing costs, intangible capital investments add less to the market value of union than nonunion firms.

While both enforcement and sharing costs lower rates of return to intangible capital, they have different effects on marginal returns (and, hence, investment propensity). When enforcement costs are low, relatively efficient arrangements between unions and firms will evolve such that firms invest in intangible capital at close to nonunion levels (i.e., both parties agree to maximize the size of the pie). In this case, unionization effectively acts as a neutral lump-sum tax on profits wherein average but not equilibrium marginal rates of return on investments are decreased. Where such arrangements are costly to establish and enforce, we expect to see a lower marginal rate of return schedule and, in response, less investment. For example, if marginal enforcement plus sharing costs of nontransferable R & D are high, unionization would act as a distortionary tax decreasing firms' R & D intensity. These possibilities are examined empirically in the next section.

III. Empirical Analysis

A. *Specification and Data*

In our empirical model, we follow Thomadakis (1977), among others, by adopting relative excess valuation, EV/S, as a normalized market value measure of profitability. By definition,

$$EV/S = [MV(F) - BV(T)]/S \tag{7}$$

where $BV(T)$ is the book value of tangible assets and S is sales. Since $MV(T) = BV(T) +$ error, e, from (1) and (7) we have

$$\begin{aligned} EV/S &= MV(I)/S + e/S \\ &= h(X) + e' \end{aligned} \tag{8}$$

where $e' = e/S$ and X includes various intangible sources of profitability. Calculated using historical cost $BV(T)$ data, EV/S has the attractive features of wide availability and of being normalized by sales—a factor and leverage neutral measure of firm size (Shalit and Sankar, 1977). Hirschey and Wichern (1984) show a close empirical relation between EV/S and an alternative market-based measure, Tobin's q (in our sample, $r_{EV/S,\,q} = 0.94$) and our results are not sensitive to the choice between EV/S and q. Our union measure is the proportion of eligible workers who are union

[7] Nonunion firms also may bear costs to enforce intangible capital property rights against dilution by their workers. Here, we need only assume that enforcement costs are larger for union than nonunion firms. Pakes and Nitzan (1983) formalize the conditions for optimum labor contracts with (nonunion) research personnel.

TABLE 1.—MEANS FOR SELECTED VARIABLES, STRATIFIED BY UNION DENSITY

Variable	Whole Sample	$U < 0.29$	$0.29 \leq U < 0.38$	$0.38 \leq U < 0.49$	$U \geq 0.49$	t^a
U	0.391	0.159	0.339	0.432	0.645	−40.04
EV/S	0.067	0.167	0.099	0.033	−0.037	4.22
$R\&D/S$	0.015	0.025	0.015	0.011	0.010	4.81
AD/S	0.007	0.008	0.008	0.008	0.002	2.99
P/S	0.019[b]	0.030	0.021	0.011	0.015	3.33
n	367	86	102	95	84	

[a] t-test for differences in means between the low and high union samples with 168 degrees of freedom.
[b] The mean of $\widetilde{P/S}$, by construction, is zero.

members in each firm's principal three-digit Census-coded industry.[8] (Definitions and sources for variables used in our analysis are provided in a data appendix.)

To summarize the implications of section II, we expect that intangible capital investments will yield smaller economic returns to shareholders in firms with higher unionization and that unions will limit investment in nonmarketable, intangible capital. In testing this hypothesis, we focus on R & D and expect a limiting effect of unions on the returns to R & D as well as R & D investment.[9] In contrast, we expect returns from relatively short-lived advertising capital investments to be relatively immune to capture by unions (see Grabowski and Mueller (1978) for depreciation rate estimates). Hence, unions ought to exert a much smaller effect on advertising investment decisions. Similarly, the return stream from patents should be little affected by unionization because patents are a marketable asset.

Because patents are an output of ongoing R & D investments, rational investors will incorporate expected patent output in the market value of the firm when R & D spending plans become known. Once the output of R & D investments is determined, valuation effects should be associated only with unanticipated patents. An unexpectedly large (small) number of patents should generate a positive (negative) impact on market value. Accordingly, we consider the profit impact of unanticipated patents.

Table 1 presents summary measures of profitability, unionism, and intangible capital investments (specifically, R & D, advertising, and patent intensity) for our 367 firm sample drawn from the 1977 *Fortune* 500, and for four subsamples stratified according to unionization. Means from our stratified samples suggest the plausibility of our hypotheses. As union density rises, EV/S and intangible capital investments, most notably in R & D, fall. The final column in table 1 presents the t-statistics for tests of differences in means between low and high union quartiles, and all differences are statistically significant.

We specify a two-equation econometric model of the profit–R & D–unionization interactions in light of theory and previous evidence, and the EV/S and R & D equations are discussed in turn (for recent work on R & D, patents, and market value, see the papers in Griliches (1984)). In addition to intangible capital sources of profitability, our EV/S equation includes controls for other dimensions of output market structure. We include the firm's weighted market share (MS), weighted concentration ratio (CR), and the share of U.S. firms in the domestic market (DOM). Based on earlier work, we also include interactions of normalized R & D with concentration ($R\&D/S \cdot CR$) (see Connolly and Hirschey, 1984) and market share ($R\&D/S \cdot MS$), as well as control variables measuring firm growth (GR), risk (B), industry maturity (AGE), diversification

[8] The use of industry-level union density data in a firm-level analysis introduces measurement error into our model, biasing the estimated union effect in an unknown direction given the complexity of the model. The union density variable can be interpreted either as the probability that a given firm will be a union firm, or as the predicted proportion of workers in a firm who are union members. Because few firms in our sample are completely unionized, we prefer the latter interpretation. In addition to the union membership data from Kokkelenberg and Sockell (1985), we also used a measure of collective bargaining coverage for 1968–1972 from Freeman and Medoff (1979). Results were very similar to those presented in the text and are available from the authors on request.

[9] Interfirm differences in annual intangible capital investments are assumed to proxy closely differences in intangible capital stocks. Assuming exponential decay and constant expenditure growth, Hirschey (1982) shows that intangible capital levels will be strictly proportional to annual expenditure rates. Weiss (1969) reports empirical support for these assumptions.

(DIV), and the inverse of size ($1/S$).[10] We consider a set of 14 broad (two-digit SIC) industry dummies (I_k) separately.[11]

A relatively general way to model union capture of returns from intangible capital and other sources is the following:

$$EV/S = a_0 U + \sum_{i=1}^{3} a_{1i} U \cdot X_{1i} + \sum_{i=1}^{3} a_{2i} U \cdot X_{2i} + \sum_{i=1}^{14} a_{3i} X_{3i} + \sum_{k=1}^{14} a_k I_k + v \quad (9)$$

where X_{1i}, containing intangible capital variables $R\&D/S$, AD/S, and $\widetilde{P/S}$, is interacted with U; X_{2i}, containing output market structure variables MS, CR, and DOM, is interacted with U; and X_{3i} contains all the variables in X_{1i} and X_{2i} plus a constant, the control variables (GR, B, AGE, DIV, $1/S$), and the R & D-market structure interaction variables ($R\&D/S \cdot CR$, $R\&D/S \cdot MS$). I_k consists of 14 industry dummies, and v is an error term with zero mean and constant variance. The a_{1i} and a_{2i} coefficients can be interpreted as the union "tax" rates on various profit sources while the coefficient a_0 is the effect of unions on profits independent of other profit determinants. Through application of appropriate coefficient restrictions, models embodying particular hypotheses can be derived.[12] For example, if $a_{1i} = a_{2i} = 0$ (for all i) but $a_0 < 0$, unionism acts as a lump-sum tax on profits, consistent with the efficient contracts hypothesis. The claims about union capture of market-power related profits made in earlier papers might be summarized crudely as $a_{1i} = 0$ and $a_{2i} < 0$. Our primary hypothesis is that $a_{1i} < 0$, indicating that the valuation effects of intangible capital, particularly R & D, are less in union than in nonunion firms.

We model union effects on R & D investment using the following equation:

$$R\&D/S = b_0 + b_1 U + b_2 U \cdot EV/S + b_3 EV/S + b_4 CR + b_5 MS + b_6 AD/S + \sum_{i=1}^{3} b_{1i} X_{1i} + \sum_{k=1}^{14} b_k I_k + w \quad (10)$$

where $U \cdot EV/S$ is the interaction of unionization and profitability; X_{1i} is a vector of control variables including GR, DIV, and $1/S$; w is an error term with zero mean and constant variance; and all other variables are as defined earlier. From section II, we expect union rent seeking will limit R & D investment intensity (i.e., $\partial(R\&D/S)/\partial U < 0$). Lower market value effects of R & D and lower R & D investment by union firms implies real union effects and inefficient contracting between unions and firms. We also expect that firms in highly unionized industries will be less likely to channel profits into vulnerable R & D investments ($b_2 < 0$). Inclusion of industry dummies in (10) may be particularly important given the large variability in R & D spending across industries (Scott, 1984) and our inability to measure directly R & D opportunity and appropriability variables (Levin et al., 1985). (For discussion of additional aspects of (10), see Connolly and Hirschey (1984).)

B. EV/S Results

Since several general hypotheses are nested in (9), we can evaluate these competing hypotheses with standard testing procedures. Based on the all-inclusive model, we could not reject the hypotheses that (1) market share and concentration do not provide a significant source of economic profits ($a_{3CR} = a_{3MS} = 0$; $F_{2,332} = 1.48$) and (2) the joint union "tax" on market power related profits is zero ($a_{2i} = 0$ for all i; $F_{3,332} = 1.18$). The critical F values for these tests are 5.43 and 4.90, respectively, and are calculated using Leamer's (1978, p. 114) method which incorporates a sample size correction. Based on these test

[10] CR is not adjusted for regional market concentration or foreign trade. Following the suggestion of referees, we examined variables measuring minimum efficient scale, capital intensity, and leverage (the latter as an alternative measure of risk). None was even marginally significant, while all inferences were unaffected.

[11] The industry dummies, measured at the two-digit or combined two-digit level, help control for the nonrandom distribution of unionization across firms and any disequilibrium present in the cross section. In work not shown, we calculated an endogenous union density variable generated from a reduced-form equation including the exogenous variables in our system plus additional labor force and industry characteristics. To calculate unanticipated patent intensity ($\widetilde{P/S}$), we estimated a two-stage least squares (2SLS) patent intensity equation where EV/S, $R\&D/S$, and CR were treated as endogenous. Additional exogenous industry- and firm-level variables were included as controls. Details of these parts of the estimation work are available on request.

[12] Tests of specific hypotheses are less powerful if relevant variables are omitted or mismeasured and if included variables capture the effects of relevant omitted variables.

results, we omit the $U \cdot X_{2i}$ variables and focus on union effects on returns from intangible capital. We reject the hypothesis of a lump-sum union "tax" ($a_0 < 0$, $a_{1i} = 0$ for all i; $F_{3,335} = 5.27$) in favor of a model where the union profit effect varies by intangible capital profit source ($a_{1i} \neq a_{1j}$ where $i \neq j$; $F_{2,335} = 10.59$).

To evaluate the potential for simultaneous equations bias, we used the Wu-Hausman test (Hausman, 1978), but could not reject the null hypothesis of no misspecification from using ordinary least squares (OLS) to estimate (9) (U, $R\&D/S$, CR, MS, and their interactions are treated as endogenous; $F_{9,326} = 3.38$; critical F is 5.68). Accordingly, table 2 contains OLS estimates for the simplified version of (9). While our primary focus is on the estimates in column (4), we provide the results in the first three columns to assist the reader in evaluating our findings.

We find strong support for our principal hypothesis: R & D adds less to the market value of union than nonunion firms. Estimates from column (4) indicate $\partial(EV/S)/\partial(R\&D/S)$ is 9.95 when $U = 0.2$ but only 4.10 when U rises to 0.5. Using the *DFBETAS*, *DFFITS*, *RSTUDENT*, and h_i (leverage) diagnostics developed by Belsley, Kuh, and Welsch (1980), we determined that the negative and significant $U \cdot R\&D/S$ coefficient cannot be traced to statistical outliers. (These diagnostics are described in detail in Belsley et al., pp. 14, 15, 20, and 16, respectively.) The diagnostics jointly identified a handful of firms as potentially influential, but excluding these firms from the sample did not affect inferences about

TABLE 2.—*EV/S* EQUATION RESULTS

Variable	(1)	(2)	(3)	(4)
U	-0.143[b]	0.054	0.004	0.082
	(-2.00)	(0.62)	(0.05)	(0.72)
$U \cdot R\&D/S$	—	-16.069[a]	-17.477[a]	-19.507[a]
		(-3.79)	(-4.19)	(-4.38)
$U \cdot AD/S$	—	—	19.169[a]	17.683[b]
			(2.74)	(2.45)
$U \cdot \widetilde{P/S}$	—	—	5.838	6.122
			(1.67)	(1.77)
$R\&D/S$	7.027[a]	11.378[a]	17.737[a]	20.109[a]
	(8.81)	(8.18)	(6.86)	(7.02)
AD/S	4.792[a]	4.529[a]	-1.468	-1.524
	(5.47)	(5.25)	(-0.61)	(-0.62)
$\widetilde{P/S}$	4.360[a]	4.141[a]	2.037	1.864
	(6.81)	(6.56)	(1.61)	(1.48)
CR	-0.310[a]	-0.258[b]	-0.059	0.065
	(-3.03)	(-2.55)	(-0.49)	(0.45)
MS	0.170	0.255	-0.426	-0.532
	(0.78)	(1.18)	(-1.46)	(-1.72)
DOM	0.217[b]	0.205[b]	0.213[a]	0.177
	(2.58)	(2.49)	(2.65)	(1.89)
$CR \cdot R\&D/S$	—	—	-16.475[a]	-20.354[a]
			(-3.32)	(-3.86)
$MS \cdot R\&D/S$	—	—	32.675[a]	38.824[a]
			(2.97)	(3.48)
I_k	Excluded $F(14,340) =$ 1.57	Excluded $F(14,339) =$ 1.69	Excluded $F(14,335) =$ 2.11	Included
R^2	0.414	0.437	0.476	0.518

Note: t-ratios are in parentheses. Reported F-statistics correspond to a test of the exclusion of the industry dummies. For all regressions, the sample size is 367, estimates are calculated using ordinary least squares, and a constant and the control variables GR, B, AGE, DIV and $1/S$ are included. Coefficient estimates for the control variables from column (4) are (t-ratios in parentheses): $GR = 1.016$ (4.70), $B = -0.043$ (-0.60), $AGE = -0.068$ (-1.74), $DIV = -0.114$ (-2.11), and $1/S = -12.575$ (-0.07).

[a]Significant at the 0.01 level (two-tailed test).

[b]Significant at the 0.05 level (two-tailed test).

TABLE 3.—*R & D/S* EQUATION RESULTS

	2SLS		OLS	
Variable	(1)	(2)	(3)	(4)
U	−0.009	−0.010	−0.021[a]	−0.020[a]
	(−0.77)	(−1.25)	(−4.06)	(−4.35)
$U \cdot EV/S$	−0.139[b]	−0.146[a]	−0.066[a]	−0.086[a]
	(−2.19)	(−2.76)	(−4.52)	(−4.99)
EV/S	0.110[a]	0.118[a]	0.037[a]	0.051[a]
	(4.92)	(7.28)	(7.60)	(9.02)
CR	0.020	0.043[a]	0.008	0.033[a]
	(0.81)	(3.20)	(1.18)	(4.95)
MS	−0.074	−0.044	−0.002	0.002
	(−1.76)	(−1.29)	(−0.15)	(0.15)
AD/S	−0.881[a]	−0.782[a]	−0.017	−0.107
	(−2.87)	(−4.27)	(−0.30)	(−1.78)
GR	−0.057[b]	−0.057[b]	−0.003	−0.001
	(−2.20)	(−2.39)	(−0.28)	(−0.08)
DIV	−0.004	0.008	−0.008[b]	0.004
	(−0.60)	(1.48)	(−2.40)	(1.16)
$1/S$	−3.031	−0.668	−2.563[b]	−0.175
	(−1.42)	(−0.37)	(−2.54)	(−0.16)
I_k	Included	Excluded $F(14,343) =$ 2.51	Included	Excluded $F(14,343) =$ 13.58
R^2	—	—	0.574	0.338

Note: t-ratios are in parentheses. For all regressions, the sample size is 367, and a constant is included. Industry dummies are excluded from the regressions as noted and the reported F-statistics correspond to a test of this restriction. In the 2SLS regressions, U, $U \cdot EV/S$, EV/S, CR, MS, and AD/S are endogenous. See also footnote 14.

[a] Significant at the 0.01 level (two-tailed test).

[b] Significant at the 0.05 level (two-tailed test).

the $U \cdot R\&D/S$ coefficient. Belsley et al. (ch. 3) also provide diagnostics which make it possible to determine whether inferences about particular coefficients are affected by collinearity, but we found no evidence of deleterious effects on our inferences related to collinearity. Our inferences about $U \cdot R\&D/S$ are also insensitive to specification. (For an explicit sensitivity analysis, see Hirsch and Connolly (1985).)

As a further check on our results, we estimate separate EV/S equations for each of the four union classes shown in table 1. In these equations, we include $R\&D/S$, AD/S, $\widetilde{P/S}$, MS, CR, DOM, GR, B, $(1/S)$, AGE, and DIV (I_k is excluded due to empty industry cells in the subsamples). Moving from the low union to the high union classes, we obtain coefficients (t-ratios in parentheses) on $R\&D/S$ of 10.217 (5.33), 5.209 (3.91), 4.262 (2.29), and 1.927 (0.95), respectively, providing further support for our basic hypothesis. Despite these differences in the $R\&D/S$ coefficient, however, we are unable to reject the joint null hypothesis of complete coefficient equality across the four regressions ($F_{36,319} = 2.77$; critical F is 6.95).[13]

In contrast with the robust results reported above, we find the valuation effects of AD/S and $\widetilde{P/S}$ increase with unionization. While we expected at most a weak, negative interaction effect of U with AD/S and $\widetilde{P/S}$, we have no convincing explanation for a positive interaction. It should be noted, however, that the $U \cdot AD/S$ and $U \cdot \widetilde{P/S}$ coefficients display considerable sensitivity to model specification and outliers in the data. Individual regressions on each union quartile provide no indication of any simple, regular relation between union density and the valuation effects of advertising and patents.

[13] To examine the possibility that the negative $U \cdot R\&D/S$ coefficient reflects differences in the valuation of R & D across industries, we followed the suggestion of Zvi Griliches and added to our EV/S equation interactions between $R\&D/S$ and the 14 industry dummies. The $U \cdot R\&D/S$ coefficient and significance level were affected very little.

C. R&D/S Results

We turn now to union effects on R&D investment decisions. We applied the Wu-Hausman test to (10) and found clear evidence of misspecification from using OLS ($F_{6,351} = 14.78$; critical F is 5.93) with the I_k excluded; however, with the I_k included, the evidence was less clear-cut ($F_{6,337} = 5.45$; critical F is 5.69). Accordingly, table 3 contains both two-stage least squares (2SLS) and OLS estimates of (10).[14] Using the 2SLS estimates from column (1), we find $R\&D/S$ declines by 0.006 when union coverage increases from, say, 0.2 to 0.5 ($\overline{R\&D/S} = 0.015$). The R&D investment decline is even larger if the indirect effect of unions on EV/S is included. We find the negative $U \cdot EV/S$ coefficient to be robust under a variety of specifications and hence conclude that unions have real as well as financial effects.

We also find (in results not shown) that the large difference in R&D investment behavior is between firms in industries with very low union density and firms in the other union classes. There are only small and marginally significant differences in the union effect on $R\&D/S$ between the three largest union classes. This suggests that even moderate levels of industry unionization significantly affect investment behavior, while the impact of further increases in union density is relatively small. Alternatively, unionism may be correlated with omitted variables measuring R&D appropriability and/or opportunity. Further research on this topic would be helpful.

D. Other Results

We find little evidence that unions capture rents associated with other dimensions of output market structure. Coefficients on $U \cdot CR$, $U \cdot MS$, and $U \cdot DOM$ are negative but statistically insignificant in most cases and there is some evidence of sensitivity to model specification (these issues are considered in detail in Hirsch and Connolly (1985)). Because of the fragility of these results and the lack of corroborative labor market evidence (see Hirsch and Connolly), we are uncomfortable with the union–market structure conclusions reached by Freeman, Karier, and Salinger. We believe the returns to R&D may provide a more important source for union rent seeking than profits related to output market concentration or market share distribution.

Finally, based on column (4) of table 2, the overall estimated union effect on profits ($\partial(EV/S)/\partial U$) is -0.087. This implies that a firm in an industry with, say, 0.5 union density would have an EV/S approximately 0.026 lower than an otherwise similar firm with 0.2 union density ($\overline{EV/S} = 0.067$).

IV. Conclusions

In this paper, we have provided theory and evidence concerning union rent seeking and its effects on firm market value and intangible capital investment. Consistent with our hypothesis that union rent seeking can take the form of a distortionary tax on the returns to long-lived investments, we find that intangible R&D investments add relatively less to the market value of firms in more unionized industries. Firms in highly unionized industries respond by investing less intensively in R&D. Despite the apparent clarity of our results, two caveats bear repeating. First, the key union variable is measured for the firm's principal three-digit industry, and not at the firm level. Second, the union variable may in part capture the effects of omitted variables, in particular, those measuring R&D appropriability and opportunity. Further research with data sets containing better measures of unionism and appropriability/opportunity variables is clearly needed.

While this paper focuses on the profit and R&D investment effects of unions, our analysis can and should be extended. If our hypotheses concerning union rent seeking and R&D investment are correct, one should observe differences in R&D strategies between union and nonunion firms. Differences should be observed not only in R&D intensity, but also in firms' "make" versus "buy" decisions, their mix between short- and long-run investments, and their propensity to pursue easily marketable investment paths.

The broader economic implications of union rent seeking may be ambiguous if, in contrast to our results, market power provides the major source for union rents. However, our finding that

[14] The endogenous variables are EV/S, U, $U \cdot EV/S$, CR, MS, and AD/S. We use Kelejian's 2SLS estimation technique since (10) is nonlinear in its variables ($U \cdot EV/S$) but linear in the parameters. The instruments include the exogenous variables in (9) and (10) and additional industry- and firm-level variables.

unionism decreases both the returns to and levels of R & D investment clearly appears to have negative implications for economic efficiency and long-run growth. There is, in fact, evidence suggesting that residual total factor productivity growth has been lower in highly unionized industries (for a summary, see Hirsch and Addison, 1986, ch. 7). Given the importance of these and related issues, we believe there exists much potential for future research on the specific routes through which union rent seeking affects firms' investment behavior and subsequent economic performance.

DATA APPENDIX

Variable	Definition and Source
EV/S	Relative excess value, given by market value of common stock plus book value of debt minus book value of tangible assets, normalized by sales. Data from Standard & Poor's *Compustat* tape, and *Fortune*, for 1977.
U	Unionization; the proportion of eligible workers who are union members in the firm's primary three-digit Census industry. Data derived from the May 1975–1977 Current Population Surveys by Kokkelenberg and Sockell (1985).
CR	Four-firm industry concentration ratio weighted to reflect firm shares in multiple four-digit industries. Data from Economic Information Services (EIS) for 1977.
MS	Market share weighted to reflect firm shares in multiple four-digit industries. Data from EIS for 1977.
DOM	Domestic share, defined as 1 − import share calculated as [(imports + duties)/(shipments − exports + imports + duties)] in a firm's primary four-digit industry. Data calculated from *U.S. Commodity Exports and Imports as Related to Output, 1977 and 1976.*
$1/S$	Inverse of size, defined as inverse of sales. Data from *Fortune* for 1977.
$R\&D/S$	R & D intensity, defined as private R & D expenditures divided by sales. Data from *Business Week* for 1977.
P/S	Patent intensity; number of patents granted in 1977 divided by sales. Data from U.S. Patent Office. ($\widetilde{P/S}$ defined in text and footnote 11.)
AD/S	Advertising intensity, defined as advertising spending divided by sales. Data from *National Leading Advertisers* for 1977.
GR	Growth, defined as geometric average of annual growth in sales for 1972–1977, from *Fortune*
B	Beta measured using 60 months of stock returns. Data from *Value Line* for 1977.
DIV	Diversification; 1 minus $\Sigma(S_i/S)^2$, where S_i is sales in the i^{th} 4-digit industry. Data from EIS, 1977.
AGE	Dummy variable for firms in technologically mature industries. Data from Grabowski and Mueller (1975).
I_k	Vector of 14 2-digit and combined 2-digit SIC industry dummies.

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