The Impact of Unionization on the Entry of Firms: Evidence from U.S. Industries

WILLIAM F. CHAPPELL
University of Mississippi, University, MS 38677

MWANGI S. KIMENYI
The University of Connecticut, Storrs, CT 06269

WALTER J. MAYER
University of Mississippi, University, MS 38677

Traditional models of entry-deterrence typically emphasize sunk costs or predatory pricing, but unionization might also discourage potential entrants. This paper explores this possibility through an empirical model of entry that includes unionization as an explanatory variable. We find that unionization has a statistically significant entry-deterring effect.

I. Introduction

The association of labor unions with large firms operating in imperfectly competitive product markets has led several researchers to integrate unionization into their empirical analyses of industry performance. For example, the profitability studies of Salinger (1984), Clark (1984), Karier (1985), Domowitz et al. (1986), Hirsch and Connolly (1987), and Chappell et al. (1991) consider whether the monopolistic power of firms in product markets is an important source of union rents. It is clear that issues raised by the possible link between noncompetitive firm behavior and unionization have generated much interest.

One issue that has received only limited attention, however, is the role that unions play in the deterrence of firm entry. Traditional models of entry-deterrence typically emphasize sunk costs or predatory pricing (Baumol and Willig (1981)), but unionization might also discourage potential entrants. This paper explores this possibility through an empirical model of entry that includes unionization as an explanatory variable.[1]

Unionization can deter entry by lowering the expected future earning streams of potential entrants in at least two ways. First, to the extent that unionization is present in the industry, potential entrants face an increased risk of becoming unionized and, thereby, incurring the costs of union wages, rules, and strikes. An abundance of empirical evidence supports the existence of sizeable union-nonunion profit differen-

tials.[2] While it might be possible for new firms to start out nonunion and, thus, initially avoid these costs, much more crucial to the entry decision is the probability that new firms eventually become unionized. Because potential entrants recognize that this probability is greater in a heavily unionized industry, high levels of industry unionization will tend to discourage entry.[3]

The other way unions can deter entry is through collaboration with incumbent firms.[4] Theoretical models in which the joint actions of unions and incumbent firms can raise the cost of entry into an industry have been developed by Williamson (1968), Maloney et al. (1979), and Dewartripont (1987, 1988). In Williamson's model, large incumbent firms and the union negotiate a wage increase, which, in turn, places upward pressure on industry-wide wages. A given increase in the wage rate, however, has differential cost effects across the industry because of technological differences between small and large firms. In particular, a given increase in the wage rate raises the costs of labor-intensive small firms more than the costs of capital-intensive large firms.[5] This asymmetry enables unions and incumbent firms to use their wage contract as a means of deterring (otherwise low-cost) small-scale entry. Williamson found some supporting evidence in a case study of the bituminous coal industry. Maloney et al. (1979, p. 633), however, argued that the sharing of joint profits gives incumbents and unions a strong incentive to collusively deter entry through regulatory legislation, for example. Finally, the models of Dewartripont emphasize the signalling effects of union contract characteristics, such as severance pay clauses that give incumbents an incentive to overproduce if entry occurs.

Despite the theoretical basis for the prediction that unionization is an important determinant of entry, available empirical evidence is quite limited. This is somewhat surprising given the large and growing number of published empirical studies on the topic of entry. Using industry-level cross-sectional data, the effects of various entry determinants have been analyzed by McGuckin (1972), Orr (1974), Gorecki (1975, 1976), Duetsch (1975, 1984), Kessides (1986, 1990), Chappell, Kimenyi, and Mayer (1990). Evidence on the effects of industry characteristics such as profits, capital, scale, and concentration has been well-documented in these studies, but none of them considers the effects of unionization.

In this paper we specify an empirical model of entry that includes unionization among the determinants. The data to be analyzed consist of a cross-section of 323 four-digit industries during the period from 1972 to 1977. Unionization in a given industry is empirically measured as the percentage of the work force unionized as reported in Freeman and Medoff (1979).[6] With a few exceptions, empirical studies have generally used net entry (for example, the number of firms in 1977 minus the number of firms in 1972) to measure the number of new entrants in a given industry. A well-known disadvantage of this approach is that observations on net entry actually reflect the difference between gross entry and exit flows and, therefore, can greatly understate the number of new entrants (gross entry). A distinguishing feature of our study is that we do not rely on indirect measures of gross entry and thereby

avoid this problem. Instead, we adopt a direct measure of gross entry recently constructed by Dunne et al. (1988).

Consistent with the argument that potential entrants seek to avoid becoming unionized, and the arguments of Williamson (1968), Maloney et al. (1979), and Dewartripont (1986, 1987), we have found that the degree of industry unionization has a negative effect on the rate of entry into an industry. Moreover, as Williamson suggested, we found that the magnitude of this effect (that is, the extent to which unionization can deter entry) is largest in industries where the labor intensity of small firms exceeds the labor intensity of large firms. In view of these results, we conclude that unionization is a potentially effective entry barrier that should be not be overlooked.

II. *An Empirical Model of Entry and Unionization*

Our basic model of entry into the ith industry along with the a priori signs is as follows:

$$ER_i = f(PCM_i, KSR_i, GR_i, ASR_i, SCL_i, CR4_i, MULT_i, UN_i).$$
$$\quad\quad + \quad\quad - \quad\quad + \quad\quad ? \quad\quad - \quad\quad - \quad\quad - \quad\quad -$$

With the exception of the unionization variable, *UN*, the model is a fairly standard empirical specification of entry. Table 1 provides the data sources, descriptions of the variables, and summary statistics. The entry variable, ER_i, measures the rate of entry into the ith industry and is defined as $NE_i(77)/NT_i(72)$, where $NE_i(77)$ denotes the number of firms entering the ith industry between 1972 and 1977, and $NT_i(72)$ denotes the total number of firms in the ith industry in 1972. The data on *ER* are from Dunne et al. (1988) which also includes a detailed analysis of *ER* and other related measures. A variety of other entry measures have been used in the literature. Previous studies have generally relied on the net change in the number firms to approximate the number of new entrants. The few studies that use either gross entry or the market share of entering firms (direct measures of entry), such as Masson and Shaanon (1982) and MacDonald (1986), are confined to extremely small samples of industries compared to the net-entry studies. The advantage of *ER* over other measures of entry is that it directly measures entry over a wide range of industries.

Following previous studies, the entry determinants include pre-entry profits (*PCM*), capital intensity (*KSR*), industry growth (*GR*), advertising intensity (*ASR*), scale economies (*SCL*), industry concentration (*CR4*), and multiplant activity (*MULT*). The arguments leading to these variables are standard ones that have been extensively discussed in the literature (see, for example, Chappell et al. (1990)). For this reason, we will only briefly summarize them here. Entry, as measured by *ER*, depends on potential profitability (*PCM* and *GR*), the presence of barriers (KSR, *SCL*, *CR4*, and *MULT*), and the effects of advertising (*ASR*). Therefore, the a priori signs of *PCM* and *GR* are positive, and those of *KSR*, *SCL*, *CR4* and *MULT* are negative. The a priori sign of *ASR* is uncertain because advertising can theoretically either deter or accommodate entry.[7]

We next turn to the role of unionization (*UN*) in the entry model. The a priori sign of *UN* is negative for two reasons. First, the presence of unionization in the

Table 1

Variable Definitions and Summary Statistics

Variable	Definition	Mean	Std. Deviation
ER	Rate of entry from 1972 to 1977	.414	.258
PCM	Industry price-cost margin in 1972	.279	.083
KSR	Capital-sales ratio in 1972	.378	.248
GR	Industry growth rate in sales, 1972 to 1977	.720	.435
ASR	Advertising-sales ratio in 1972	.025	.146
SCL	Value-added per employee of the four largest firms divided by value-added per employee of all smaller firms, 1972	1.39	.479
CR4	Four-firm concentration ratio in 1972	.398	.208
MULT	Number of plants in 1972 minus the number of firms in 1972 divided by the number of firms in 1972	.240	.366
UN	Percentage of work force unionized, 1972	.468	.145
LI	Labor intensity of small firms relative to large firms, 1972	1.20	.368

Sources: The data on *ER* are from Dunne et al. (1988). Data to construct *PCM, KSR, GR, SCL, CR4, MULT,* and *LI* are from 1977 *Census of Manufactures,* vol. 2, parts 1, 2, and 3 (see tables entitled "Historical Statistics for the Industry: 1977 and Earlier Years") and from vol. 1, part 9 (see table entitled "Share of Selected Items Accounted for by the 4 Largest Companies and Complementary Groupings Ranked on Value of Shipments for Each Industry: 1977"). Advertising levels are from 1972 Input-Output Tables. Unionization levels are from Freeman and Medoff (1979). A list of the SIC industries is available on request.

industry increases the risk of potential entrants becoming unionized.[8,9] Second, for reasons given in Williamson (1968), Maloney et al. (1979) and Dewartripont (1987, 1988), unionization gives incumbent firms a means to raise the costs of entry. Dewartripont (1987, 1988) has argued that, under incomplete information about profits, union contracts can signal a reluctance on the part of incumbents to reduce output in the presence of entry. Maloney et al. (1979) argued that unions and incumbents both have a strong incentive to lobby for entry-deterring regulatory legislation. Williamson (1968) argued that existing contractual arrangements between unions and incumbents can impose costly wage rates on new entrants through either natural pressures for wage uniformity or specific agreements. Although not explicitly discussed by Williamson, "natural pressures for wage uniformity" presumably include factors such as threat effects; otherwise, nonunion entrants could defeat this strategy.[10]

Williamson's model also predicts that the effectiveness of labor unions as an entry barrier depends on the technological configuration of large and small firms within the industry. The prediction is that unionization is most effective when

increases in the wage rate raise the average costs of small firms more than the average costs of large firms.[11] The presence of such asymmetry increases the incentive to deter small-scale entry (through union-induced industry-wide wage hikes) by decreasing the cost to incumbents of achieving a given level of deterrence. Salop and Scheffman (1983, 1987) have recently generalized this argument.

One determinant of small- and large-firm cost asymmetry, which lends itself to empirical measurement, is the labor intensity of small firms relative to the labor intensity of large firms. In general, the more labor intensive small firms are relative to large firms in the industry, the greater the potential for an industry-wide increase in wage rates to produce differential cost effects and, therefore, the greater the potential for unionization to be an effective entry barrier.[12] To test this implication of Williamson's (1968), we adopted the convention of using the four largest (in terms of sales) firms to represent "large firms" in an industry, and the remaining firms to represent "small firms."[13] We then defined the following empirical measure of relative small-large firm labor intensity:

$$LI_i = (TP{<}4_i / TS{<}4_i) / (TP4_i / TS4_i),$$

where $TP{<}4$ equals total payroll of all firms smaller than the largest four firms in industry; $TS{<}4$ is total sales of all firms smaller than the largest four firms in the industry; $TP4$ is total payroll of the four largest firms in the industry; and $TS4$ equals total sales of the four largest firms in the industry.

We next defined the following indicators of high and low relative labor intensity:

$$HLI_i = 1, \text{ if } LI_i > 1; \ = 0, \text{ otherwise; and}$$
$$LLI_i = 1, \text{ if } LI_i < 1; \ = 0, \text{ otherwise.}$$

The differential effects predicted by Williamson's model can then be tested by including in the model the interaction variables $UN{*}HLI$ and $UN{*}LLI$. Because $HLI = 1$ indicates that small firm labor intensity is greater than large firm labor intensity (as measured by LI), evidence that $UN{*}HLI$ has a larger impact on entry (ER) than $UN{*}LLI$ does would be consistent with the prediction.

III. Regression Results

These considerations lead to the following regression model:

$$ER_i = \beta_0 + PCM_i\beta_1 + KSR_i\beta_2 + GR_i\beta_3 + ASR_i\beta_4 + SCL_i\beta_5$$
$$+ CR4_i\beta_6 + MULT_i\beta_7 + UN_i{*}HLI_i\beta_8 + UN_i{*}LLI_i\beta_9 + \varepsilon_i.$$

Table 2 reports the ordinary least squares estimates of the model.[14] The first column reports the restricted ($\beta_8 - \beta_9$) estimates and the second column the unrestricted estimates, with the latter specification allowing for the differential effects discussed in Section II. For the conventional entry determinants ($PCM, KSR, GR, ASR, SCL, CR4,$ and $MULT$), both sets of estimates are generally as predicted by economic theory and generally consistent with the results of previous studies. The rate of entry into an industry varies directly with pre-entry profits (PCM), industry growth (GR) and

Table 2

OLS Estimates of Entry-Rate Equation
323 Manufacturing Industries, 1972-1977
(t-statistics in parentheses)

Variable	Restricted Estimates	Unrestricted Estimates
PCM	.1814 (0.93)	.1595 (0.83)
KSR	-.1561[a] (-2.55)	-.1689[a] (-2.76)
GR	.1984[a] (6.74)	.1982[a] (6.77)
ASR	.1101 (1.06)	.1092 (1.06)
SCL	.0203 (0.65)	.0366 (1.15)
CR4	-.2497[a] (-3.81)	-.2606[a] (-3.99)
MULT	-.1033[a] (-2.64)	-.0978[a] (-2.51)
UN	-.1442[c] (-1.65)	—
UN*HLI	—	-.1948[b] (-1.90)
UN*LLI	—	-.0577 (-.54)
RSS	14.353	14.123
F-test $(\beta_8-\beta_9)$	—	4.94[b]

a, b, and c denote significance at 1, 5, and 10 percent levels, respectively.

advertising *(ASR)*, and varies inversely with capital intensity *(KSR)*, industry concentration *(CR4)*, and multiplant activity *(MULT)*.

At the same time, the estimates corresponding to the unionization variables lend support to the notion that labor unions have a significant entry-deterring effect. The restricted estimate corresponding to *UN* is negative and significant at the 10 percent level. The unrestricted estimates also support the existence of an entry-deterring effect, but the support is qualified as these estimates suggest that the importance of the effect is not uniform across industries. Instead, the extent to which unionization

deters entry appears to depend on the relative labor intensities of small and large firms in a way that is consistent with Williamson's model. More specifically, the coefficient of *UN*HLI* is over two times larger in magnitude than that of *UN*LLI,* and the difference is statistically significant. Using an F-test (computed from the restricted and unrestricted residual sums of squares), the equality of these coefficients can be rejected at the 2 percent level. Moreover, the coefficient of *UN*HLI* is negative and significant at the 5 percent level, whereas that of *UN*LLI,* while also negative, is not significant at any reasonable level.

IV. *Concluding Remarks*

This paper reports cross-sectional evidence on the relationship between entry and the extent of unionization. Using a direct measure of entry, we found that labor unions have a significant entry-deterring effect. We also find that statistical significance is limited to industries in which small-scale production is more labor intensive than large scale production. It should be emphasized, however, that this finding does not limit the importance of unionization as an entry barrier. The majority of United States industries are characterized by the above asymmetry. For instance, in 78 percent of the 323 four-digit industries in our sample, small-firm labor intensity exceeds large-firm labor intensity ($HLI = 1$). In constructing models of entry, the effects of unionization should be taken into account.

These results support the existence of entry deterrence through unionization, but they are less clear on precisely how unionization works to deter entry. A similar limitation characterizes many, if not most, empirical studies in industrial organization, but it does not undermine their usefulness. As Schmalensee (1989, p. 952) observed, "cross-sectional studies rarely if ever yield consistent estimates of structural parameters, but they can produce useful stylized facts to guide theory construction and analysis of particular industries."

Although the finding that statistical significance is limited to certain industries can be explained by the Williamson model, more extensive data are needed to control for the effects hypothesized by Maloney et al. (1979) and Dewartripont (1987, 1988). For example, detailed data on severance pay characteristics of union contracts might prove to be useful in constructing tests of the Dewartripont models. In sum, our results represent only a first step in uncovering the complex relationship between unionization and entry. We hope that this research will stimulate further interest in exploring alternative explanations of the entry-deterring mechanism used by unions.

NOTES

[*]We are grateful to William F. Shughart II for providing useful comments, and thank a referee for several helpful suggestions. We also thank Timothy Dunne for providing data from Dunne, Roberts, and Samuelson (1988). The standard disclaimer applies.

[1]The working paper of Dunne and Macpherson (1991) empirically examines a related issue, namely the impact of unions on sectoral gross employment flows.

[2]See, for example, Clark (1984), Hirsch and Connolly (1987), and Chappell et al. (1991).

[3]Acs and Audretsch (1989) conjecture that small firms can avoid becoming unionized and, therefore, unlike other firms, might find it profitable to enter a heavily unionized industry.

[4]The collaboration models treat the level of unionization as exogenous to the firms decision problem and, therefore, do not address the question as to whether incumbent firms would encourage or discourage unionization of the industry.

[5]Stigler (1963) and Caves and Pugel (1980) have provided empirical evidence that large firms are generally more capital intensive than small firms within an industry. This finding is consistent with the firm heterogeneity theory of Mills (1984) and Mills and Schumann (1985), who hypothesized that small firms are more flexible than large firms and that this is accomplished through a greater reliance on variable production factors.

[6]Data on the dependent variable (entry) are at the four-digit level. Unfortunately unionization levels are not available at the four-digit level. The Freeman-Medoff data are reported at the three-digit level. In addition, the Freeman-Medoff estimate for unionization in 1972 is actually an average from surveys taken in 1968, 1970, and 1972. These characteristics could potentially cause some biases in the estimation, but there is no better alternative. Hopefully, four-digit observations on unionization will be available in the future. This would allow more precise estimates of the effect of unionization on industry entry as well as other measures of industry performance such profitability.

[7]On the one hand, advertising can entrench the position of incumbent firms through brand loyalty and product differentiation. To the extent that potential entrants perceive these factors as risks, entry is deterred. On the other hand, advertising can promote competition by increasing available information on prices and product quality. To the extent that potential entrants perceive advertising as a means to successfully penetrate the market, advertising accommodates entry. For a comprehensive discussion of these issues, see Kessides (1986).

[8]The expected present value of potential future earnings stream for entrants will be affected by large union-nonunion profit differentials within industries. In particular, the expected earnings stream will be a function of union and nonunion excess market values weighted by the probabilities of a new firm being union and nonunion. This is captured (although rather crudely) in our model through PCM which proxies future earnings and UN which proxies the probability of unionization. Data availability obviously places severe restrictions on the measurement of the expected earnings stream.

[9]We are assuming that entrants use the industry average rate of unionization as an index of the probability of eventually becoming unionized. An alternative and perhaps more direct approach would be to construct an index from union election results over time across industries. Such an index, however, should be closely related to the current level of unionization. If 90 percent of the workers in an industry are unionized, for example, then presumably this was the result of successful union elections in the past.

[10]The relationship between nonunion wages and level of unionization in an industry is a complex one that depends on a variety of factors, including the threat of union organization within nonunion firms. To the extent that threat effects are a dominant factor, nonunion firms increase their wages in order to make unionization less attractive. Formal treatments of threat effects can be found in Rosen (1969) and Hundley (1987). Empirical evidence supporting the existence of threat effects can be found in Rosen (1969), Martin and Rence (1984), Moore et al. (1985), and Hundley (1987)). Union wage hikes can also spread to nonunion firms for reasons other than threat effects. For example, Flanagan (1976) and Vroman (1982)

considered the possibility that nonunion firms increase their wages in response to union wage hikes to avoid morale and, thus, productivity problems.

[11]Direct evidence showing that the union profit effect is larger for firms with small market shares can be found in Clark (1984) and Hirsch (1990).

[12]This argument assumes that in response to an industry-wide increase in wage rates, small firms raise their capital-labor ratios proportionately less than large firms do. For a comprehensive discussion, see Williamson (1968).

[13]See, for example, Carter (1978), Chappell and Cottle (1985), and Chappell et al. (1990).

[14]At the suggestion of a referee, the model includes two-digit industry dummies to control for unmeasured industry effects correlated with entry. The two-digit industries consist of two groups: durable manufactures and nondurable manufactures. There are 10 industries in each group. Using F-tests, the null hypothesis of no differential effects was tested across all 20 industries and within each group. The null was decisively rejected across all 20 industries and within the nondurable group. For the durable group, however, the computed value of the F-statistic was only .81 and, therefore, no evidence of differential effects across these industries was found. In view of these results, the industries in the durable group were assigned a single dummy and individual dummies were assigned to each of the remaining industries.

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