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The Property Rights Theory of the Firm: Empirical Results from a Natural Experiment

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In the property rights theory of the firm (Williamson 1969, 1970; Alchian 1961; Alchian and Kessel 1962; Alchian and Demsetz 1972; Furubotn and Pejovich 1972) a connection is made between the property rights in the firm held by the decision maker and the behavior of that decision maker. This paper compares the performance of firms with different types of property rights in providing a standardized product under contract to the federal government.[1]

The standardized product is physician services insurance (Part B) claim processing for the Medicare program. Both private property firms (commercial profit-seeking insurance companies) and attenuated property rights firms (nonprofit mutual and Blue Shield firms) provide these services to the Medicare administration for different administrative areas. Thus, the Social Security Administration has provided an opportunity for observing the influence of alternative specifications of property rights on the performance of the firms.

Theory

Under private property rights the decision maker has the right to (1) decide about the use of the firm's resources, (2) keep the residual (total revenue minus contractural costs), and (3) capitalize any wealth gains of the firm by selling his rights.

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[1] For discussion of the nature of the contract see Blair, Ginsburg, and Vogel (1975).

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As property rights are attenuated for a nonprofit firm, the decision maker cannot keep the residual. Further, he cannot capitalize additions to the firm's wealth by selling the rights to future income flows.

The attenuated rights lead to different behavior than private property rights in two ways. First, the attenuated rights effectively reduce the price of nonpecuniary amenities (pleasant offices and colleagues, short working hours, greater output) to the decision makers. This leads to choice of lower firm wealth and more nonpecuniary benefits.

Using the approach of Williamson (1970), the effects of attenuated property rights can be formalized. The decision maker maximizes a strictly concave utility function over wealth, W, and nonpecuniary benefits, N, $U(W, N)$, subject to the concave technological and market constraint on the possibilities combinations of W and N, $T(W, N) \leq 0$, and the non-private-property constraint[2] limiting wealth to the present value of salary, S, $W - S \leq 0$. Ignoring corner solutions, the marginal condition is $(dW/dN) = -(\partial U/\partial N)/[(\partial U/\partial W) - \lambda_2]$, where λ_2 is the Legrangion multiplier for the non-private-property constraint.

The interpretation of this condition is straightforward. Under private-property rights, $\lambda_2 = 0$, and the technical rate of exchange W and N is equated to the rate of substitution in utility terms. This corresponds to point Op in figure 1.

However, under attenuated property rights, $\lambda_2 > 0$. Thus (dW/dN) is lower (more negative). This can only occur where W is lower and N is higher, corresponding to Os is figure 1.

Thus, attenuated property rights lead to a choice of lower firm wealth and greater nonpecuniary benefits. If these nonpecuniary benefits include elements other than quantity and quality of output, the nonprofit firm will exhibit higher production costs, for the same output, than the profit-seeking firm.

The second way in which behavior altered is that the attenuated rights reduce the gains to the takeover of poorly managed firms. The gains of efficient new management are of less value to the new owner because he could neither retain the residual in wealth terms nor sell his ownership after improving the management of the firm.

The result of these reinforcing effects is that, in Alchian and Demsetz's words (1972, p. 790), "One should, therefore, find greater (management) shirking in nonprofit . . . enterprises."

An aside on the survival of nonprofit firms.—The analysis presented above implies that nonprofit firms will operate less efficiently than profit-seeking firms. If entry were free, competition would lead to the demise of nonprofit

[2] It may be possible to increase wealth by giving up some other benefits, but this only complicates the analysis.

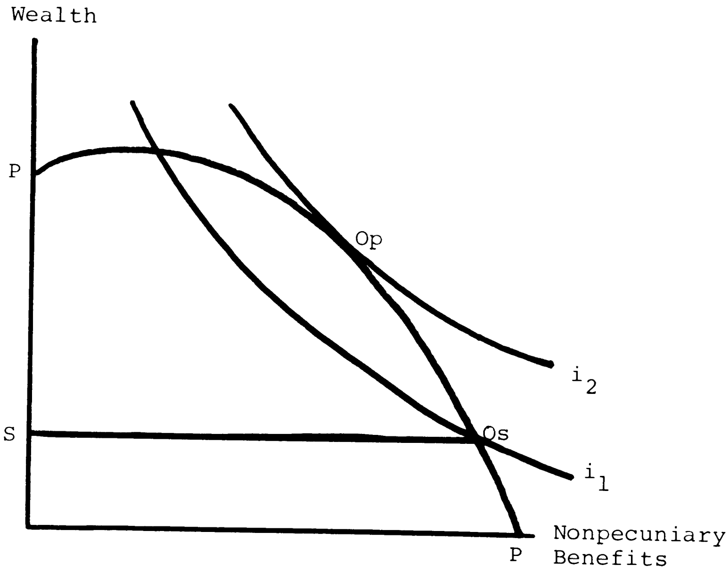

FIG. 1.—Property rights and the optimal combination of firm wealth and managerial nonpecuniary benefits.

firms. There are two reasons why this predicted disappearance of nonprofit firms does not occur.

First, and simplest, government regulation may cause cost disadvantages for profit-seeking firms. This will be discussed below.

Second, the nonprofit legal form has important advantages for a firm whose output is subsidized by charitable contributions. Donors (either private parties or the government) do not want the firm's owners' wealth maximized—they seek to raise the firm's output. By preventing appropriation of the residual, they can be assured that donations and grants must be spent within the firm. If output is an important nonpecuniary benefit to the firm decision maker, donations will increase output.

Past Studies

In spite of the intuitive appeal and apparent importance of the analysis, there have been relatively few attempts to measure empirically the impact of alternative property rights specifications on costs of operation. The ones which have been undertaken (Nichols 1967; Clarkson 1971, 1972; Davies 1971; Spiller 1972) suffer from the problem that the output is not quite held constant nor controlled for in the analysis. The result is some degree of ambiguity concerning the independent influence of property rights structure versus the difference in costs of supplying different products. Another important weakness in much of the work is a lack of statistical testing (Clarkson's work is an important exception). This study examines the data on Medicare insurance claim processing by intermediary firms of differing property rights structures. This provides a natural experiment, where the data allow one to attribute with some confidence differences to property rights structures, since the specification of output and the legal environment are determined by contract with the Social Security Administration.[3]

Industry Structure

The health insurance industry, from which Medicare intermediaries are chosen by the Social Security Administration, is largely made up of three types of firms, ordinary profit-seeking insurers, mutual insurers, and Blue Cross and Blue Shield nonprofit firms which provide physician and hospital insurance, respectively.

By the argument of the "Theory" section above, the nonprofit insurers should be unable to compete with the more efficient profit-seeking insurers. Therefore, the survival of the mutual and Blue Cross–Blue Shield firms deserves some comment.

In the case of the mutual firms, it appears that their form allows them to undercut the regulated insurance price by paying dividends to insurers (Kimball 1960). Further, as is discussed below, their actual property rights may not be very different from profit seeking firms.

Blue Cross and Blue Shield firms survive because of quite strong regulatory and tax advantages in almost every state (Frech 1974). In many states, Blue Cross and Shield firms pay no taxes on property or premium income, while profit-seeking and mutual firms must pay such taxes. Premium taxes alone average about 2 percent of gross premium volume. In the majority of states, special laws have been passed granting tax and regulatory advantages to these firms.

The Experiment

The Social Security Administration contracts with private health insurance firms for claim processing services. These firms deal directly with medical care providers and consumers. A government report on the Medicare program states that "the carriers' principal function is to determine whether charges are allowable (reasonable) and to make

[3] For more detail on the nature of the relationship of the Social Security Administration to the independent intermediaries, see Blair, Ginsburg and Vogel (1975) and U.S. Department of Health, Education, and Welfare (1973*b*).

TABLE 1

MEDICARE PROCESSING PERFORMANCE AND OWNERSHIP

	Cost per Dollar Processed	Average Processing Time (Days)	Errors per $1,000 Processed
Profit-seeking firms ($N = 12$)	$0.0715 (0.0178)	18.70 (10.34)	0.1844 (0.0717)
Nonprofit firms ($N = 66$)	0.1039 (0.0331)	33.59 (19.83)	0.4426 (0.7576)
Approximate t-value for difference of means ..	4.908	3.565	2.706
Degrees of freedom	29.9	31.3	70.9
Statistical significance (one-tail test)	< .0005	.0009	.005

NOTE.—If variances are assumed to be different and unknown, the appropriate test statistic is an approximate t-value (Yamane 1967, pp. 522–24). Standard deviations are shown in parentheses.

payment" (U.S. Department of Health, Education, and Welfare 1973*b*). Thus, the carriers have no role in such common insurance activities as classification of risks and determination of benefit packages. The narrowness of the service and its contractural (rather than market) determination are important advantages. Unmeasured variation in type of service is likely to be very low.

As is obvious from the large variation in the data on costs and performance, firms and their geographical regions were not selected on the basis of competitive bidding. Further, no carrier has been dropped for poor performance. Since the selection and retention of intermediaries was not based on cost minimization, efficiency cannot be inferred from survivorship.

The Empirical Analysis

Property rights and performance.—The first step to determine the influence of property rights structure on performance is to examine the actual performance of the firms. The data presented in table 1 give the means, standard deviations, and statistical significance level of the difference in means for average cost per dollar processed, average processing time, and errors per dollar processed for nonprofit and profit-seeking Medicare Part B intermediaries, based on data from the Social Security Administration (U.S. Department of Health, Education, and Welfare 1973*a*).[4] Nonprofit firms include Blue Shield, one government agency, one

[4] A nonprofit firm with very poor performance was deleted from the sample because of incomplete data on errors.

prepaid group practice, and mutual (owned by policyholders) firms.[5] As one can see, the superiority of the private property firms is striking. The probability of these performance differences occurring by chance is apparently very low.

Scale and performance.—Observation of the scale of operation of the intermediary operations of the profit-seeking and nonprofit firms reveals that the average nonprofit firm operation is smaller ($6.679 million contrasted to $8.914 million per month). It may be interesting to examine how much of the lower performance of the nonprofit firms can be associated with the lower scale of operation. Further, the nonprofit firms produce at a lower scale in the dimension of what Hirshleifer (1962) calls the breadth of production. The size of the average claim of the nonprofit firm is lower than that of the profit firm ($32.12 vs. $45). Following Hirshleifer's reasoning, aggregating the same dollar value of payments into fewer larger claims would lower costs. Thus, I will examine the relationship of performance to these two dimensions of scale to see if the poorer performance of the nonprofit firms can be explained entirely by low levels in these two scale dimensions.

For purposes of the estimated functions, the scale variables must be taken as exogenous due to lack of data. Based on the same data as the comparison of means, functions have been estimated relating performance to the two dimensions of scale and the property right structure of the firm.

Estimated equations.—The simplest version of the cost function takes the following form (in logs): $\text{CPAY} = C + \beta_1 \text{ PAY} + \beta_2 \text{ CLSZ} + \beta_3 \text{ NP}$, where C is a constant, CPAY is the cost of processing per dollar payment[6] made by the intermediary PAY is a scale variable, the dollar value of the payments made by the intermediary; CLSZ is the size of the average claim, a measure of the breadth of production; and NP is a dummy variable (not in logs) which takes on the value zero for a private property and one for a nonprofit firm.[7]

For the other output dimensions, average processing time (in days), TIME, and the number of errors per dollar processed, EAPY, and the

[5] Although mutual insurers are nominally nonprofit firms, their actual constraints may be quite similar to profit-seeking firms. First, the remuneration of the top-management group is not closely regulated. Second, mutual firms often have close corporate ties with profit-seeking firms. Thus, one might expect their behavior to be more like profit-seeking firms. When mutuals are compared with other nonprofit firms they perform significantly better in terms of cost and processing time, but slightly (and statistically insignificantly) worse in the dimension of accuracy. Apparently their property rights are somewhat less attenuated than those of the typical nonprofit firms.

[6] A reasonable alternative definition of average cost is cost per claim processed. This amounts to deflating cost and errors by the number of claims, rather than by dollar volume. Equations (1)–(3) were reestimated, using this definition. The results were virtually identical, except for slightly worse fit to the data.

[7] More complex functional forms, such as quadratic and dummied slopes, gave similar results, but with notably lower t-values and R^2 (corrected for degrees of freedom).

reduced-form equation is of the same form. Below are the equations, which were estimated using ordinary least squares (t-statistics in parentheses):

$$\underset{}{\text{CPAY}} = -0.703 \quad \underset{(-2.598)}{-0.051\ \text{PAY}} \quad \underset{(-3.517)}{-0.390\ \text{CLSZ}} \quad \underset{(2.219)}{+0.152\ \text{NP}} \qquad (1)$$
$$N = 78,\ R^2 = .605.$$

$$\text{TIME} = 1.931 \quad \underset{(-1.482)}{-0.080\ \text{PAY}} \quad \underset{(1.435)}{+0.436\ \text{CLSZ}} \quad \underset{(3.179)}{+0.600\ \text{NP}} \qquad (2)$$
$$N = 78,\ R^2 = .140.$$

$$\text{EPAY} = 5.815 \quad \underset{(0.333)}{+0.032\ \text{PAY}} \quad \underset{(-3.723)}{-2.084\ \text{CLSZ}} \quad \underset{(-1.618)}{-0.550\ \text{NP}} \qquad (3)$$
$$N = 78,\ R^2 = .294.$$

The cost function is most interesting. This simple model, with only two dimensions of scale and the property rights variable, explains over 60 percent of the cost variation. The effect of a nonprofit property rights structure is to raise costs by about 15 percent. And the difference is significant at the 5 percent level.

The equation for the determination of TIME does not fit as well, explaining only about 14 percent of variation of TIME. However, the results are quite interesting and reasonable. Scale has a negative effect on processing time, while the size of *each claim* (reflecting claim complexity, in part) increases TIME. Note that the nonprofit firms perform substantially worse in this dimension, NP increases TIME by about 60 percent, with the coefficient significant at the 0.1 percent level.

The equation for errors per dollar of payment fits better than the one for TIME, explaining about 30 percent of the variation in EPAY. Scale is essentially unrelated to EPAY, while the average claim size is strongly negatively related, presumably because processing the same number of dollars with fewer claims leads to fewer opportunities for errors. Turning to the property rights variable, EPAY is the only output dimension for which controlling for the two scale dimensions reverses the result that nonprofit firms are less efficient. However, the NP variable is not significant at the 5 percent level (the t-statistic of -1.618 is significant at approximately the 10 percent level).

Unfortunately, unless one rejects the relationship of NP to EPAY as statistically insignificant, the results are ambiguous to the issue of whether the choice of scale is the main determinant of nonprofit inefficiency or whether the entire cost surface is higher for such firms. There are two possible ways to get some indication concerning whether private property rights lowers the firm's cost surface. The most natural is simply to enter the variable EPAY as an explanatory variable in equations (1) and (2) to see if nonprofit firms have higher costs and slower processing times holding errors constant. Doing that results in the following equations:

$$\begin{aligned} \text{CPAY} = -0.745 \quad & \underset{(-2.592)}{-0.051\ \text{PAY}} \quad \underset{(3.075)}{-0.375\ \text{CLSZ}} \\ & \underset{(2.224)}{+0.156\ \text{NP}} \quad \underset{(0.307)}{+0.007\ \text{EPAY}} \\ N = 78,\ & R^2 = .605. \end{aligned} \tag{4}$$

$$\begin{aligned} \text{TIME} = 1.395 \quad & \underset{(-1.547)}{-0.083\ \text{PAY}} \quad \underset{(1.905)}{+0.628\ \text{CLSZ}} \\ & \underset{(3.413)}{+0.648\ \text{NP}} \quad \underset{(1.444)}{+0.921\ \text{EPAY}} \\ N = 78,\ & R^2 = .164. \end{aligned} \tag{5}$$

Taken at face value, these equations indicate that even holding EPAY constant private property firms are more efficient in terms of costs and processing time. Inclusion of EPAY in the two equations makes virtually no difference. This would seem to add confidence to our results.

Unfortunately, there is a serious econometric problem with this approach: EPAY is not exogenous. In fact, the errors in equation (3) are doubtlessly positively correlated with those of equations (4) and (5). If the errors in those equations represent firms which are either poorly managed or operate in a high-cost environment, these firms are likely to perform badly in all three output dimensions. Thus, the errors will be positively correlated and the coefficient of EPAY in equations (4) and (5) will be biased upward. Since the true tradeoff between TIME or CPAY and EPAY is clearly negative (errors can only be reduced by processing slower or more carefully at a higher cost), the positive coefficients of equations (4) and (5) for EPAY indicate the extent of the simultaneous-equations bias and do not estimate the shape of the production possibility tradeoff among the three dimensions of output.

Since we are not specifically interested in the shape of this tradeoff, the incorrect sign on EPAY creates no problem. However, the bias indicates that the equations (4) and (5) do not control for EPAY, and therefore one cannot reject the hypothesis that the nonprofit firms are slower and have higher costs solely because they are more careful, which results in fewer errors (holding scale constant).

An alternative approach is to take the point estimates of the reduced-form equations as accurate and see how high a price one would have to place on the fewer errors of the nonprofit firms in order for their total costs to be equal to those of the private property firms (here we ignore the advantages of quick processing by the profit-seeking firms).

Working through the calculations for this approach I find that the implicit cost of an accounting error would have to be implausibly high at about $67.88 for the nonprofit performance to be equal to the profit-seeking firms.[8]

Summary and conclusion.—The evidence suggests that private property firms are more efficient as Medicare processing intermediaries than nonprofit firms. Nonprofit firms incur processing costs per dollar processed which are 45 percent higher. Their processing takes 80 percent longer. Further, nonprofit firms make 140 percent more errors per dollar processed. These differences are significant at very high levels of confidence.

Exploration by regression analysis of the impact of economies of scale in overall operations and in aggregating claims showed that some, but not all of this difference was due to inefficiently low scale in both dimensions for nonprofit firms. Apparently nonprofit firms not only chose inefficient points on their cost surface, but the entire surface is higher for them.

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[8] We seek the implicit price of an accounting error, Pe, which would nullify the predicted difference in CPAY between the two types of firms. That is, the solution to Δ CPAY = Pe ΔEPAY, where ΔCPAY is the predicted difference between the two types of firms in CPAY in equation (1) and ΔEPAY is the predicted difference in EPAY from equation (2) expressed in terms of errors per dollar processed (rather than per $1,000 processed as in table 1 and equation [3]). Using the estimated coefficients on NP from the equations and the means of sample we solve

$$(0.0989)(0.152) = \text{Pe}(0.403)(10^{-3})(0.550),$$
$$\text{Pe} = \$67.88.$$

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