APPLICATION OF THE ‘OAXACA DECOMPOSITION’ TO PROBIT ESTIMATES

The Case of Unions and Fringe Benefit Provision

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Using several standard approaches this paper presents estimates of the effect of unions on benefit provision consistent with those in the literature. A new estimation approach is then presented which embodies several advantages and amounts to an Oaxaca decomposition performed on two probit equations. The resulting estimates depart sharply from those in the literature suggesting unions may have far less direct influence on benefits than originally thought.

1. Introduction

The positive influence of unions on fringe benefits has become as much a part of the stylized facts of labor economics as the positive union influence on wages. Recent debate attempts to separate the influence of unions on benefit levels (or generosity) from the influence of unions on the provision of the particular benefit in the first place. For example, Fosu (1983) finds that the union influence on pensions comes entirely on their provision and that the generosity of union and non-union pensions are nearly identical. On the other hand, the union influence on health insurance is divided with union members both more likely to receive insurance and receiving more generous policies than their non-union counterparts.

Not only is the union influence on benefit provision taken for granted, but the magnitude of this effect traditionally falls into a relatively narrow range. Freeman and Medoff (1984, p. 67) examine the role of unions in providing pensions and health insurance using four separate data sets. They present a range of results indicating that unions increase the probability of receiving a pension by 0.24 to 0.32, and that they increase the probability of receiving health insurance by 0.14 to 0.18. Such double digit estimates are common and Fosu’s own estimates are within the ranges given by Freeman and Medoff.

The testing methodology that ties these results together is their reliance on a single estimating equation. Thus, the coefficients for the independent variables are not allowed to vary by union status. When using a linear estimating equation this restriction is relatively unimportant. For example, union wage differentials estimated with a single combined equation or with separate equations for each sector, following Oaxaca (1973), are roughly the same. This is guaranteed because the estimated values go through the point of means. When non-linear estimating equations are used there is no reason to expect close congruence between the single- and two-equation estimates. This

1 Thus, it is common to claim that the single equation estimate lies between the two estimates generated by the Oaxaca decomposition. The two estimates are generated by using the means of the two sectors as the bases.
distinction becomes relevant because the influence of unions on benefit provision is typically estimated with a single non-linear probit equation.\(^2\)

This paper estimates the influence of unionization on the provision of benefits using a variety of single- and two-equation methods. When the estimates are based either on a single equation or on two linear equations, the magnitudes compare closely with those presented in the past. When the estimate is based on two non-linear equations, the magnitudes are a fraction of the previous estimate. Nonetheless, the latter estimate has several claims to superiority, suggesting that previous estimates may, indeed, be too large.

2. Methodology and results

We examine data from the May 1983 Current Population Survey (CPS), limiting ourselves to private, non-agricultural workers who are not self-employed. This data source is appropriate as respondents are asked whether they receive a pension or health insurance from their employer. The answers to these questions become dichotomous dependent variables for each of the specifications. In each case we include a full complement of explanatory variables, including a constant, years of education, years of experience, experience squared, race, gender, a series of occupational dummies, regional dummies, plant size dummies, whether the respondent works part-time, whether the respondent works in an SMSA, marital status, and the worker’s current log wage.

In our first series of estimates, we fit a probit equation for each fringe, including a union membership dummy among the explanatory variables. We then estimate the difference between the predicted probability of union and non-union benefit provision by evaluating the estimated cumulative distribution function with the membership dummy equal initially to one and then to zero. This estimate of the effect of membership is obtained at the mean of the explanatory variables for the full sample and for the union and non-union subsamples as shown in the first three rows of table 1. The familiar pattern emerges with double digit effects and the effect on pensions generally somewhat

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Pensions</th>
<th>Health insurance</th>
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<tbody>
<tr>
<td>Single probit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Sample means</td>
<td>0.280</td>
<td>0.218</td>
</tr>
<tr>
<td>(2) Union means</td>
<td>0.244</td>
<td>0.314</td>
</tr>
<tr>
<td>(3) Non-union means</td>
<td>0.289</td>
<td>0.206</td>
</tr>
<tr>
<td>Two linear equations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Union base</td>
<td>0.284</td>
<td>0.176</td>
</tr>
<tr>
<td>(5) Non-union base</td>
<td>0.279</td>
<td>0.231</td>
</tr>
<tr>
<td>Two probit equations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Union base</td>
<td>0.091</td>
<td>0.049</td>
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<tr>
<td>(2) Non-union base</td>
<td>0.094</td>
<td>0.069</td>
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</tbody>
</table>

\(^a\) These estimates follow the description in the text. The full set of equations estimated are available from the authors.

\(^2\) In addition to the sources already cited see Heywood (1988).
stronger than that on insurance. Indeed, the pension estimates fall squarely in the range obtained by Freeman and Medoff for other data sets.

In our second series of estimates, we allow for interaction between the independent variables and union status by estimating separate union and non-union linear probability equations for each fringe. In this case, the traditional Oaxaca decomposition was performed to examine the differential resulting from differences in the coefficients holding individual characteristics constant. The union base differential results from using the means for the union subsample to predict the probability of provision first in the union equation and then in the non-union equation. The latter prediction is substracted from the former isolating the effect of union status from that of individual characteristics. The non-union base differential is calculated in a similar fashion. These estimates are presented in the fourth and fifth rows of table 1. Again, the estimates conform well with prior expectations.

Despite the similarity of the two types of estimates, they are each flawed in their own way. The single equation probit constrains the coefficients for union and non-union members to be identical. This assumption violates much of what is known about the wage determination process and what we might surmise about the determination of benefit provision. Wage determination under collective bargaining differs substantially from non-union determination. Specifically, the returns to human capital characteristics are smaller than in the union sector [see Blcck and Kuskin (1978) among others]. As benefits are another element of the compensation package, we suspect their determination may also differ between sectors. If this suspicion is correct, the true union effect will be much more complicated than a simple dummy would indicate.

The linear probability model allows coefficients to differ by sector but presents serious problems of its own. Along with its well-known heteroskedasticity and lack of efficiency, predicted values from the linear model can lie outside the zero to one interval. This is particularly problematic for the Oaxaca decomposition which requires the observations from one subsample to be used in the predictive equation of the other subsample. The averaged predictions can thus be sensitive to this falling of the linear probability model.

To combine the best of the two previous methods, we estimate separate probit equations for the union and non-union subsamples. The observations of the union sample are used to get predicted values from the union and non-union cumulative distribution function. The difference between the average values of the two predictions is the union base. A similar non-union base can be estimated. These estimates are presented in the final two rows of table 1. While the effect of unions on health insurance remains smaller than that on pensions, the difference between these and the previous estimates is striking. They have fallen to approximately a third of their previous values. This suggests that previous estimates of the influence of unions on the provision of fringe benefits may be greatly exaggerated.

3. Conclusions

Previous work indicates that unions increase the probability of receiving fringe benefits. Indeed, estimates of that influence have fallen into a fairly narrow range. Yet, most estimates depend on a single equation methodology. While differentials from single equations and those from two equations may be similar when the equations are linear, there are reasons to suspect that this is not the case with non-linear equations. Our evidence confirms that suspicion and indicates that estimates with an appropriate two-probit specification are only a fraction of those estimated in more traditional manners. Nonetheless, the two-probit specification has the natural advantages of probit for dealing

3 The full estimations for these equations and all others discussed in this article are available from the authors.
with dummy dependent variables and allows the coefficients to alter between sectors. Thus, the true influence of unions on fringe benefits may be smaller than commonly believed.

References