

discrimination on employee qualifications, but that is a different problem.

IS GENDER A CAUSE?

I have argued elsewhere (Holland, 1986a) that gender is not usefully thought of as a cause in many social science applications, and I would like to point out that I (and, I believe, Dempster) have remained true to this position in the present discussion. The “causes” involved here are discriminatory practices in salary administration, not the genders of the people involved. It is true that gender plays a role in the causal theory (B), but only in the sense that the causal effect of discrimination varies with the gender of the employee (which is, after all, what *discrimination* means). This distinction is blurred in the regression function, $E(Y_d | G, X_d) = k + \alpha G + X_d \beta$, where one is apt to call α the “effect” of G on Y_d . This is unfortunate usage and is often a source of confusion in the casual causal talk that often accompanies regression analyses. Dempster is to be admired for avoiding such a casual approach to causation.

CONCLUSIONS

I hope I have sketched enough to show that the use of Rubin’s model, with its focus on the measurement of causal effects, can be used to produce a crisp analysis of the employment discrimination problem that is very similar to much of that given by Dempster but without his need to interpret Y_c as the result of an optimal decision rule used by a thoughtful employer who invokes posterior means, loss functions and prior distributions. $Y_c(u)$ is a crucial number that we usu-

ally do not observe and which, because of this, can easily be swept under the rug and forgotten. Who really knows how Y_c should be determined? Is it possible to make serious efforts to actually *measure* some Y_c values rather than to continue to make them up? Perhaps there are some firms or parts of firms that do not discriminate in their administration of salaries; could their data be used to study Y_c directly in some specialized situations? On the other hand, because of the difficulty (and, often, the impossibility) of measuring Y_c , it should be clear that the analysis of employment discrimination differs significantly from the standard observational study in which the responses of *both* treated and control cases are always obtained. A regression analysis done either forward or backward cannot solve this fundamental problem with the analysis of employment discrimination.

I believe that the problem of employment discrimination is both serious and complex. It surely deserves a better effort than a parade of tired, old regression “paradoxes” by well intentioned men and women through countless courtrooms; if such a parade is the best that statistical science can do, perhaps it is doing more harm than good.

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Comment: Statistical Science and Economic Science

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Professor Dempster has argued in favor of constructing models that explicitly specify stochastic components, and against the alternative of using models that introduce convenient but *ad hoc* chance

mechanisms. There is increasing recognition among academic econometricians that this explicit specification is necessary for a model to be causal, that is, for a model to evaluate counterfactuals reliably and therefore to be employed for the purpose of policy evaluation. Explicitly specified stochastic components often arise from economic agents having information sets broader than analysts’ information sets, as in Dempster’s approach. A very successful application of this strategy is the development of asset pricing

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models and generalized method of moments estimators (Hansen and Singleton, 1982). The application to employment discrimination is inherently more difficult. The emphasis on causal models with explicit stochastic components is well placed, but there is little cause for optimism that major, positive developments will take place soon.

In the substantive core of this article (Section 3), Dempster has shown that it is exceedingly difficult to learn anything about α^* when X^* is not observed, without introducing strong priors. Under certain strong assumptions, the multiple indicator or multiple cause model will provide α^* , but these assumptions are artifacts of statistical convenience and not substantively defensible. Real progress will be made only through the elucidation of additional information, or at least characterizations of that information sufficient to identify α^* . In Dempster's notation that amounts to prior information about X_2 , which surely must come indirectly. Clearly there is a premium on the development of tools for prior elicitation, through the use of forward regressions, reverse regression or otherwise. The legal admissibility of uncovering and incorporating a large dose of information beyond what is found in administrative records may be dubious, but on scientific grounds it is essential.

The use of (3) as a starting point is troublesome, however. If one is to insist on a realistic interpretation of stochastic components one needs a realistic model, and (3) falls far short of this standard. This model completely ignores a large and relevant body of literature in economics. As observed by Conway and Roberts (1983, page 84):

"The theory of labor economics has much to contribute to an understanding of how economic factors affect the employer's decisions on hiring, termination, promotion and compensation of workers, as well as the employee's decisions to accept a job, seek promotion or demand a wage increase. Economic concepts are essential for formulating structural models of the employment process that are used in discrimination studies."

Economic concepts are notably lacking in the causal model assumed in this article. "True worth," Y^{**} , is taken as a primitive, but it is undefined here and absent in economics. It is very difficult to imagine a careful conceptual interpretation of this idea, much less an operational one, as the examples of Michelson and Blattenberger (1984) illustrate. Is Y^{**} to be regarded as marginal product? This would be appropriate given perfectly competitive markets, but per-

fectly competitive markets leave no room for discrimination, as the present article hints in trying to disentangle judgmental and prejudicial discrimination.

More generally, one could interpret Y^{**} as that which the employer would offer given complete information. In this case there are two problems with (3). First, given uncertainty, why would a nondiscriminatory employer pay $E[Y^{**} | G, X]$? A host of factors well studied by economists will lead employers to behave otherwise, including costs of search and hiring, risk aversion by employers and/or employees and the existence of monopsony or oligopsony. The burden of proof is on Dempster to provide an interesting model that defines Y^{**} and in which (3) then emerges. Second, labor contracts are two-sided. Even if the employer sets Y^* according to (3), employees are always free to leave. Those who do are more often lowly paid than highly paid, and in many models of labor turnover the selection of leavers and stayers is related to X^* . These considerations lead to departures from the model $Y^* = E[Y^{**} | G, X]$ which are not trivial, and they require a complete reworking of the argument beyond (3). Put another way, (3) cannot be defended as an approximation in the same way that assumptions of linearity or normality can be justified.

In short, there is no causal model in this article. Professor Dempster's thesis is correct, but it demands that we consider a behavioral, as opposed to a statistical, model of the labor market. If the behavior is economic, then the model must specify who is optimizing what given which information, and it must specify the offer, tenure, promotion, quit process and the structure of wages within the firm. There seems to be little point in elaborating or uncovering relationships between observed and unobserved X^* , without incorporating this information in an internally consistent behavioral model. Pursued jointly, these two projects might tell us much about the existence of discrimination in labor markets.

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