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# Introduction

Sherwin Rosen

When the Universities–National Bureau Committee for Economic Research requested me to investigate the possibility of a conference on the theme “Low-Income Labor Markets,” I undertook the task with some trepidation. My own belief is that simple class distinctions never show up in the data and that modern research in labor economics has proven that more general and wide-ranging investigations ultimately bear better fruit than narrow and perhaps parochial ones. In a word, why censor the data? If the theories are any good, they should be able to account for at least middle-income markets as well! My investigations into the possibility of a conference and discussions with friends and the Committee resulted in a conference of somewhat wider scope and a slightly altered title. Its substantive content is, however, related to several issues that were closely connected to discussions of “low-income labor markets” in those days. The papers and comments presented here are concerned with four major themes: (1) labor mobility, job turnover, and life cycle dynamics; (2) analysis of unemployment compensation and employment policy; (3) labor market discrimination; and (4) labor market information and investment. I hope the reader will agree with me that the decision was a good one. In fact, the papers that follow present an excellent sampling of the best of modern research in labor economics, combining some of the most sophisticated theory, econometric methods, and high-quality data on a host of empirically relevant problems.

In what follows I present a detailed reader’s guide to each of the papers and, befitting an enterprise of this sort, offer some suggestions on where the work might be pushed or extended in the future.

## **Labor Mobility, Turnover, and Life Cycle Dynamics**

The paper by Jacob Mincer and Boyan Jovanovic is a fine substantive contribution in its own right, but also serves as an excellent introduction

to the modern study of labor mobility, whose main analytical difficulty lies in its relation to the theory of stochastic processes. Clearly, viewing the mobility problem as a probabilistic process, as in part 2 of the paper, especially with the time series or panel data now becoming available, is at the frontier of the subject and, if I may make a prediction, will be a major innovative development in labor econometrics in the years to come. The paper is also interesting for its simple empirical results that are basically obtained by standard methods applied to averages over the underlying microprocess, results which the subsequent paper by Ann Bartel and George Borjas extend, using similar ensemble average methods. James Heckman's paper then links up very nicely with many of the econometric issues raised.

In the economics of ordinary exchange it is the gains from trade that are fundamental and not the personal identities of the traders. Thus, for example, the amount of bread a consumer buys and the price paid are objects of analysis, whereas whether or not the bread was purchased from store A, B, C, or Z is of no consequence. Until very recently most modern empirical research in labor economics has followed this line. Why, therefore, should mobility be an important subject for study? I believe there are two reasons. First, to follow the analogy above a bit further, it would be interesting to know that if seller C offered the good at a lower price than the rest, the probability of a buyer's going to outlet C increased. Otherwise the law of one price and the efficiency of the market institution would be impaired. So it is in labor markets as well. Labor mobility is the primary means for getting labor resources to their highest-valued uses. The separation decisions examined by Borjas and Bartel and the labor supply decisions examined by Heckman can be thought of in this way. Second, there is empirical evidence that a great deal of job mobility throughout the life cycle, i.e., unstable work histories, is associated with low earnings and poverty. It is important to understand the dynamics leading up to such outcomes of life cycle behavior. Mincer and Jovanovic analyze the the problem in the context of the theory of general and firm-specific human capital: wage dispersion induces mobility as individuals attempt to take advantage of unusual circumstances; firm-specific human capital investments give rise to rents that tend to reduce mobility. Somewhere a balance is struck.

The particular problem addressed by Mincer and Jovanovic is how to use panel data on mobility and wages to ascertain the proportions by which human capital investments are general or firm specific, i.e., are tied to labor market experience or current job tenure. Specific human capital creates a wedge between actual wages paid or received and opportunity wages, the differences representing returns on specific investments. Larger specific investments increase the wedge and therefore reduce mobility. Consequently the probability of separation should diminish

with tenure if specific investment increases with tenure. However, in a group of measurably similar people a whole distribution of job tenure will be observed, indicating either considerable unobserved differences in specific investments, or heterogeneity. Thus, it is possible to observe a declining relation between separation probabilities and tenure that has no causal significance, since those with greater propensities to move will always exhibit greater separation rates and lower tenure than those with the opposite propensities. The difficulty for analysis therefore is to purge the data of this mechanical effect arising from heterogeneous populations.

Mincer and Jovanovic control for this effect by introducing measures of previous mobility. While specific job tenure remains an important determinant of mobility, supporting the specific human capital argument, its influence is much smaller if these controls are introduced. A similar argument, with similar empirical results, is also applied to the observed positive relationship between wages and specific job tenure. Drawing on these results and other work, the authors tentatively conclude that general human capital accounts for about one-half of the total, that specific investments account for about one-fourth, and that the remainder is due to interfirm mobility as arbitrage activity. This is an extremely important question to which this paper is the first, to my knowledge, to propose a workable and plausible answer. Clearly, an even better answer should be a major goal on the research agenda.

Bartel and Borjas present an empirical analysis of the relationship between wage growth and job mobility, using the theory of human capital as the central concept for organizing the data. Two effects of job mobility are examined: (1) the effect on differential life cycle wage growth between jobs of "origin and destination"; (2) the influence on life cycle wage growth in any given job. The data used come from panel surveys of older and young men in the 1969–73 period.

A number of interesting results are obtained. First, the effects of mobility on wage growth are different for young men and for older men. Generally, greater gains were associated with mobility among young men, reflecting the differential role of turnover between these two groups: the search-investment aspect of turnover in discovering a life career and a conformable job has greatest value for youth. The results of the analysis, at least for quits, are broadly consistent with this notion of investment. On the other hand, turnover among adult workers tends either to have a greater element of surprise (e.g., an unanticipated plant closing) or to be representative of workers who for one reason or another tend to turn over at much higher than average rates. While the latter selectivity effect is not precisely modeled by Bartel and Borjas, some simple tests that utilize the panel feature of the data strongly suggest that it is not the most important source of variation. In addition, the effects of

turnover on wage growth vary with the cause of turnover, (permanent) layoffs tending to reduce subsequent wage growth and quits tending to increase it, or at least not to decrease it as much as layoffs. This presents a theoretical puzzle that remains to be resolved in future research; economic theory suggests that there should be no difference in response, since job separations should occur if and only if productivity on the current job is less than productivity on an alternative job. Therefore, who initiates the turnover decision should be irrelevant to the outcome. It may be, however, that nonpecuniary factors (working conditions) intervene in this process and somehow cause the asymmetry, or that jobs subject to permanent layoff probabilities are inherently riskier than others, calling for a compensatory differential wage that would tend to reduce subsequent wage growth. Both of these possibilities as well as others remain to be explored.

Second, the authors examine wage growth within a given job spell, predicting that greater expected tenure should result in greater investment and therefore greater wage growth. The method used is conceptually very interesting: it is found that those with longer spells exhibit greater life cycle wage growth, as the theory predicts. However, as Gilbert Ghez notes in his comment, the theory predicts some interactions that are not tested; and, in addition, use of completed spells as a measure of expected employment duration is subject to substantial error of measurement. One might add on this latter point that the measurement error tends to bias their result toward zero and against accepting the economic hypothesis. Also, the statistical method should be extended to cases where the current spell of employment has not ended. The fact that such individuals are not utilized in the comparisons undoubtedly also biases the estimated effects toward zero since it tends to censor longer-tenure people from the sample.

Finally, the panel or time series aspect of the data is used to help resolve some of the difficulties of distinguishing between general and job-specific experience in cross-section data. The empirical results apparently show that specific training is an important component of life cycle wage determination, since those individuals who have greater specific firm experience have greater lifetime wage growth. The methods used try to net out individual fixed effects on earnings levels, but heterogeneity in turnover propensities is not completely handled by these methods. Again, much work remains to be done in this important area.

James Heckman begins to develop a dynamic model of labor force participation behavior of married women that can be used to explain panel data. The work is related to, but also considerably extends, his earlier work on selection and heterogeneity in cross-section data. The statistical models are complicated, but are necessary to account for the dynamic behavior observed in the data, and while the emphasis here is on

the decision of whether or not to participate in the market, it is clear that these methods will prove useful for other related problems, such as unemployment behavior.

The paper begins with an extremely clear exposition of the statistical issues by analogy with a class of statistical models known as “urn schemes.” What is especially intriguing is how the problem is put in the context of some very elementary and easily understood stochastic processes, which are required to complete the description of dynamic behavior in panel data. These models have several distinct components. They include (1) a pure random effect, where the decision to participate in any given period is independent of the decision in other periods; (2) the effect of heterogeneous populations, whereby unobserved differences in tastes and opportunities imply permanent differences in participation decisions among individuals; (3) the possible effect of “state dependence,” whereby the decision to participate in any given period alters the probability of participating in future periods; and (4) a serially correlated random effect whereby the unobserved error is not independent from period to period, but rather displays some temporary persistence, a “half-life” of greater than a single period, but not a permanent effect.

The effects of permanent differences or heterogeneity are well understood from previous work. The decision to participate depends on whether the market wage exceeds the reservation wage, and both market wages and reservation wages depend on observable factors such as schooling and number of children and on unobservable factors such as ability and health status that are known to market participants but not to the econometric analyst, and therefore are best treated in the statistical analysis by various distributional assumptions. Panel data allow for a generalization of these urn schemes to the effect of state dependence, a phenomenon which has clear theoretical foundations, but which cannot be analyzed in cross-section data. The fundamental reason for expecting previous participation decisions to influence future decisions lies in the theory of investment in human capital. The decision to participate today implies some capital accumulation which affects the decision to participate tomorrow. Costs of making decisions or fixed costs of participating might have similar effects as well. These issues are of obvious importance to a host of phenomena in labor economics as well as to labor force participation.

Treating the problem as an investment decision suggests a theoretical formulation in terms of a dynamic programming model of decisions over the life cycle. Although that formal apparatus is not developed in his paper, Heckman adopts a relatively simple empirical specification that is a natural first approximation. The empirical work itself is a careful investigation of various aspects of the model, of course using panel data. Heckman finds that previous labor market decisions are determinants of

current participation decisions for older women but not for younger women, a finding that is consistent with and explained by the theory of human investment. Younger women, who anticipate childbirth, have lower incentives to invest in labor market skills than women who anticipate a longer future participation and hence higher return on investment. A considerable amount of heterogeneity among both older and younger women is found, and neglect of these interpersonal differences leads to marked overestimates of labor market turnover and to biased estimates of the effects of exogenous variables on the probability of participation. Finally, Heckman discovers that the unobservables determining participation follow a first-order Markov process, and, although the serial correlation is quite high, any initial differences among people tend to vanish with the passage of time, at least if the period considered is long enough. In earlier work on this problem, a fixed effect specification has been used to model unobservable differences among people, which literally imposes a "serial correlation" of unity. Writing the disturbance as a Markov process relaxes that assumption, and it is found that a pure fixed effect model is not entirely appropriate.

### **Unemployment Compensation and Employment Policy**

In their imaginative and innovative paper, John Abowd and Orley Ashenfelter examine the effect of anticipated temporary unemployment on wage rates, a subject dear to the hearts of all labor economists, representing as it does modern variations on a theme by Adam Smith. Even apart from the obvious intellectual interest of this problem, it has much practical interest, in that it concerns the extent to which the labor market itself provides a form of unemployment insurance or compensation in addition to that provided through the public sector. The considerable empirical work underlying this paper is among the first serious substantive studies and unquestionably the most sophisticated investigations of Smith's ancient point.

The theoretical model used to organize the data parallels Smith's theory very closely, albeit in a neoclassical language and notation. Beginning with the theory of labor supply based on the demand for leisure, the authors first define unemployment as a situation in which a worker desires to work more hours than the employer desires to employ at the going wage. For whatever reason, an hours constraint is binding for an unemployed worker. This calls for a wage-compensating variation for an hours-constrained job in order for it to achieve equal utility with an unconstrained job and hence be consistent with supply of workers. This wage-compensating variation is the value of rationed hours with imputations for the value of leisure. Next, the hours constraint is considered to be a random variable, binding with probability rather than with certainty.

In this case, a wage-compensating variation is required not merely for the actuarial adjustment of probability of occurrence, as in the first case, but also for the fear and uncertainty of temporary unemployment on the part of risk-averse workers. To these two effects, both identified by Smith, Abowd and Ashenfelter add an offset factor arising from eligibility for government-sponsored unemployment insurance.

In this model a labor market contract specifies a fixed probability of layoff, with a given expected duration and variance. If the offered attributes differ among firms or industries, labor market clearing through supply equalization requires compensatory wage differentials depending on workers' preferences for leisure and for risk bearing.

As is true of many of the papers in this volume, the model is implemented empirically using panel data, with the theoretical counterparts of contract terms estimated by computer-intensive methods from employment histories of workers in the sample in 1967–75. To avoid employment instability having to do with search and career development activities, which are beyond the scope of the paper, the sample is confined to stably employed individuals with lengthy records of labor force experience and job tenure. First, the unemployment probabilities and expected durations unemployed are estimated, conditional upon previous unemployment history, personal variables, and industry-specific effects. Layoff incidence, duration unemployed, and duration variance by industry that arise from these estimates are of substantial interest in their own right, indicating considerable risk in the construction industry and durable manufacturing and much less in government and professional service. These estimates are used to construct contract unemployment attributes suggested by the theoretical formulation.

The results provide strong confirmation of the utility-maximizing hypothesis: workers demand a significant amount of wage compensation for risk bearing and constrained employment opportunities, with the former accounting for the bulk of the differential. While these differentials vary by industry and year, depending on the actual characteristics of the contract, they average as large as seven percent in some of the estimates and fourteen percent in some industries. The differential is also found to fall as eligibility for public unemployment insurance increases, though the estimated replacement effect is rather too large for the model. Two other structural parameters are identified by the model. The compensated labor supply elasticity (for prime-age white males) is found to be in the neighborhood of that estimated from other studies, or approximately .10. The coefficient of relative risk aversion is found to be very large.

This interesting study clearly deserves replication and extension to new data. The model also needs to be extended to the decisions of firms, beginning, as the authors suggest, with the implicit contracts literature.

Additional evidence should also be available from the sorting patterns of workers with different preferences among firms offering different risk and constraint characteristics. If sorting by personal characteristics and preferences is the rule rather than the exception in this kind of world, some difficult conceptual and econometric issues arise in precisely ascertaining and measuring the extent of unemployment risk attributable to firms and therefore in need of compensation. One could even imagine a dual set of compensating variations on the other side of the market, if continuity, reliability, and turnover probabilities are of importance to firms as contributions to specific human capital or for other considerations. Clearly this work opens new territory on an important subject.

In their paper on job search, Nicholas Kiefer and George Neumann contrast and compare two econometric methods for inferring behavioral response patterns to the stimulus of varying official unemployment compensation parameters, such as the benefit rate, or of other policies, such as a wage subsidy to the unemployed. The methods are discussed in the context of data on unemployed persons who had permanently lost their jobs owing to plant closings. The standard method of analyzing such data, and a natural first approach, is to observe the outcomes of the job search process. Then completed duration unemployed is statistically related to personal variables such as schooling and previous job experience and also to unemployment compensation parameters such as benefit rate and benefit duration. Similarly, the wage on the new job might be related to the same set of variables. Kiefer and Neumann call this a reduced form approach and argue convincingly that, here as in many other areas of applied economics, a structural approach may be more useful than, or at least a useful supplement to, the reduced form model.

A structural model of unemployment duration and subsequent wage gain or loss is constructed on the basis of the sampling theory of search now familiar in the literature. The decision to accept a job is based on comparing the wages actually encountered in the search process with a reservation wage calculated on the basis of the perceived offer-wage distribution and the costs of search. The structural model consists of an offer-wage distribution and a nonstochastic reservation-wage function. These are inherently related to each other from the theory of search, but are separately identified because some measurable factors affect the costs of search and shift the reservation wage, independently of the given offer-wage distribution. Such separation would be problematic at the macro level where it might be supposed that anything shifting the reservation wage of everyone would, through the forces of supply and demand, ultimately be reflected in the offer-wage distribution. However, the independence assumption seems to be a tolerable approximation at the micro level of the data or for differences among people operating in the same general market. In this setup, the actual data on the reemployment

wage and unemployment duration distributions are considered to be the outcomes of the stochastic process modeled by the theory of search. Indeed, the likelihood function in the structural method is the probability of observing the sample joint distribution. The reduced form approach may be most easily thought of as the expected unemployment duration and subsequent wage, conditional on personal characteristics and program parameters, whereas the structural estimates attempt to reveal the stochastic process itself.

There are two advantages of the structural approach, although the reduced form estimates are clearly complementary to it. First, it allows one to ask more questions concerning interventions into the stochastic process. For example, in the paper, Kiefer and Neumann ask what a personal wage subsidy would do to unemployment duration and subsequent wages. This simply cannot be answered from reduced form estimates, but can be answered from the structural estimates if the subsidy is viewed as a shifter of the offer-wage distribution. Second, the reduced form approach is most useful in comparing the whole histories of experience of those in the sample. If at some time in the sampling period there remain individuals who have not found jobs, data on them cannot be utilized in the reduced form estimation, and this censorship of the sample may lead to biased estimates if not handled appropriately. The structural approach utilizes the information on those who have not found employment and makes an imputation for them based on some distributional assumptions.

Kiefer and Neumann's basic results are that for those individuals who were permanently laid off their previous jobs, unemployment insurance parameters have little effect on unemployment duration and subsequent wage. The same conclusions emerge from both reduced form and structural estimates. The wage subsidy is found to be far more successful in increasing subsequent wages. Another interesting empirical result is that the true variance of the wage-offer distribution is very small relative to interpersonal differences in permanent earnings capacity due to corresponding differences in ability, health status, and so on. This suggests to me that the search theory in its pure form cannot in any case explain a great deal of the unemployment behavior of this group of workers. This estimate of variance, whatever its interpretation, is of course something that could not have been known in advance and without a structural model. In fact, it is one of the few actual estimates of such parameters to be found in the literature. Finally, I do not believe, and I am sure the authors would concur, that these results are informative about the effects of unemployment compensation for those who are not on permanent layoff status, which according to some estimates is a very large fraction of the unemployed. It is ironic that the present system appears to have greater influence on transitory behavior and temporary unemployment

than on the disaster of a permanent loss of job due to adverse shifts in demand for labor for particular uses.

By way of contrast, the paper by Frank Brechling is devoted to an empirical analysis of the effects of official unemployment compensation on aspects of employment and labor turnover using pooled state cross-section and time series data. While most empirical research on the effects of unemployment compensation has been conducted at the micro level of worker behavior, Brechling's work is best read as one of the few studies that have attempted to ascertain the firms' responses to changes in various program parameters. The emphasis here is on the role of experience rating in decisions concerning layoffs, rehires, unemployment durations, and hours of work.

Recent research on unemployment insurance, including some by Brechling himself, has keyed on two fundamental parameters of the unemployment insurance (UI) system: the tax treatment of benefits and the degree of experience rating. The fact that UI benefits are exempt from personal income taxation has the effect of subsidizing temporary periods of full-time leisure instead of uniformly shorter work schedules or work weeks. Shorter workdays tend to be an inferior alternative to complete absence from work because the income earned while working is subject to tax and UI benefits are not. This feature of the insurance system increases the demand for temporary layoffs on the part of workers. Insofar as layoffs are temporary, the firm need not greatly fear that it will suffer large subsequent hiring and training expenses either. On the other side of the coin, imperfect experience-rating schemes, which are characteristic of our system, tend actually to increase the "supply" of jobs subject to temporary layoffs. Imperfect experience rating is another way of saying that there are actuarial imbalances built into the system. These largely come from limitations on the maximum tax rate that tend to subsidize cyclical and seasonal firms and to tax the firms in more stable industries. This alters relative costs and, through corresponding variations in relative product prices, tends artificially to encourage demand in cyclically sensitive sectors as well as the adoption of a more volatile employment policy by any given firm. Brechling adds an additional twist, suggesting that imperfect experience rating directly affects duration unemployed by encouraging firms to use greater inventory stockpiling to meet transitory changes in demand.

The empirical work uses time series data on layoff and unemployment durations, combined with state averages for various industry classifications. Variation in program parameters arises from changes over time and differences among the states in tax and benefit levels. As noted in the comment by Daniel Hamermesh, some of the time series variation in these parameters cannot be entirely exogenous, since changes in state balances due to experience in previous years often call for corresponding

overall changes in taxes within a given state. Therefore the results must rest upon the pooled nature of the data; interstate differences in program parameters must constitute the essential source of independent variation. Published benefit levels at this level of aggregation are available in less detail than various features of the tax system, and Brechling accordingly concentrates on the latter, achieving the most careful and detailed specific empirical specification of the experience-rating system currently available. Since the actual payroll tax system is subject to several nonlinearities, at least five parameters are necessary in order fully to characterize it. Of all these parameters, the tax rate applying to firms with negative balances, i.e., the tax rate which is most responsible for the lack of experience rating in the system, is found to have the largest effect. Increases in this tax reduce not only layoffs and rehires, but also unemployment duration and hours of work of the remaining employed, as the theory would suggest.

John Bishop represents one of the first attempts to assess the effects of employment tax credits on the demand for workers in the construction, trucking, and trade sectors of the economy. It is a familiar proposition to students of macroeconomics schooled in the IS-LM tradition that governmental tax and expenditure policy may produce stimulus or contraction tending to offset the opposite tendencies in the private economy. Up to recent years it was commonly felt that direct employment through public works was not sufficiently sensitive in timing to be countercyclical. In addition, it was also held that tax policies had widespread effects on general business expansion or contraction. Changes in federal income tax rates or in corporate or business tax schedules, including depreciation provisions, thus became the main focus of fiscal policy. While policies directly affecting employment had been advocated in the thirties and unemployment and related indicators have always been the major signals of recessions and booms, it is only in recent years that policies directly affecting employment have been seriously considered. Thus the modern equivalent of public works, perhaps, is public employment subsidies through state governments; and the fiscal counterpart to stimulating investment through investment tax credits is direct employment tax credits. Such a policy was tried in 1977–78 under the Federal Unemployment Tax Act. Since the credits were limited in amounts, it is likely that their major impact would be on smaller firms located in the industries that Bishop studies.

The basic methodology followed by Bishop is to estimate the equivalent of labor demand functions for each industry from monthly time series data, including relevant factor prices, a rental price for capital that allows for the effect of investment tax credits and the like, and direct shift variables accounting for the influence of employment tax credits. An interesting aspect of the employment tax credit put into operation in 1977

was that it applied only to incremental employment over and above existing levels of employment in the firm. This nonlinear subsidy properly reduces the fiscal burden while at the same time giving appropriate marginal incentives to increase employment. However, it also gives incentives to reduce hours of work, so that the total effect on overall labor input employed could be less than the direct employment effect. Bishop therefore appropriately investigates both employment and hours responses. Measuring the tax credit variable by proportion of firms who were aware of the tax credit, and allowing for a lagged effect, Bishop reports a fairly substantial effect of the credit on total employment by March of 1978, perhaps as much as one-half million additional employed. While this increment is a small fraction of total employment in these industries, it is a much higher fraction of unemployment originating in these industries. Bishop also reports the anticipated negative effect on hours, so the combined effect is roughly half as large as that on employment alone.

It would be interesting to check these results against direct evidence of effects on employment, by examining tax returns to see the extent to which credits were actually taken by firms. There are broader issues raised by these kinds of policies as well that need further analysis, the primary one of course being the cost-benefit calculus that would support them from the point of view of economic efficiency. There are also questions, as Bishop notes, of their effects on employment stability if maintained as a permanent fixture on the economic scene, as well as questions of tax incidence and shifting and effects on labor supply.

### **Labor Market Discrimination**

Using a variety of sources, and in a veritable onslaught of data and figures, Richard Freeman presents an extensive empirical analysis of the economic status of blacks relative to whites in the decades of the sixties and seventies. The best data available on family and personal incomes come from various survey sources, and Freeman combines them in an imaginative way. He makes a convincing case that relative labor market discrimination against blacks has declined markedly in these two decades. He goes on to argue that the decline in discrimination has been so great that other factors determining economic status, such as family background, are by now the most important causes of black-white income differentials among young workers, to the extent of swamping any residual "pure" discrimination that might remain for these workers. That is, the really large gains made by blacks has been predominantly among those who came from families with higher socioeconomic status. These status differentials are a relatively new phenomenon among black workers. If these findings represent permanent structural shifts, the results

imply further barriers to racial income equality until the dynamics of the intergenerational transfer mechanism and the influence of home environment on economic success become fully worked out. Finally, Freeman uses some time series comparisons to argue the controversial position that the progress of blacks was in large measure caused by government antibias activity, and in particular the Civil Rights Act of 1964.

Two main sources of data are used to establish the improvement of black economic status. The first is various census surveys and the Current Population Survey (CPS) in alternative years. These show an advance in the ratio of black-white incomes that accelerates in the 1960s and continues through the mid-seventies. It is not impeded, as many had feared, by cyclical variations in aggregate employment conditions. These comparisons also show relative gains among blacks for young workers, relatively skilled workers, and women. Part of the improvement in black incomes is shown also to be due to a relative improvement in the extent to which black workers are found on higher paying jobs (i.e., a relative occupational shift) as well as to an increase in salaries relative to white workers, at least for a selected group of jobs.

The second source of data used is the panels from the National Longitudinal Survey, which imply convergence of blacks and whites in educational attainment of youth. Here the change in the role of family background is manifest as well. For older men in this sample, family background variables play a much smaller role in determining educational attainment for blacks than whites, while for younger men its role is approximately equal for both groups. Furthermore, regional differentials (particularly Southern and rural) that were a major explanatory factor for older black men have about equal effects and explanatory power for both white and black young men. These changes in social mobility patterns are summarized by Freeman in the form of standardized comparisons, which tend to show that family background differences are a much more important cause of black-white schooling differences among young men than among old men, presumably because of the decline in the discriminatory effects of rural residences and region. These same data are also used to show that family background has become a much more important factor in determining earnings differentials among young men than among older men as well: by 1969 schooling and occupational status differences were by far the major source of earnings differences among young workers, with residual measured discrimination having a very small impact, though a somewhat larger one for older men.

The most controversial part of Freeman's paper is the attribution of the erosion of wage discrimination to the Civil Rights Act of 1964 and the Equal Employment Opportunities Commission of 1965. A time series regression of relative wage and salary earnings of nonwhites to whites over the 1948-75 period is the main empirical support for this argument.

Independent variables are trend and cycle variables, relative employment and relative participation variables (to capture various aspects of supply and demand), and relative schooling, relative employment, and relative participation rates, all of which serve as control variables for various aspects of demand and supply. The crucial variable then is one that measures cumulated expenditures by the equal employment opportunity agency per nonwhite worker. The equal opportunity variable tends to have a significant coefficient, but it is basically a post-1964 trend variable. Freeman marshals a lot of evidence and makes a strong case that the Civil Rights Act was instrumental in improving economic status of nonwhites. Nevertheless, the case is still not entirely airtight. While it is clear that there was a change in behavior in the 1960s, there is still a problem of ascertaining cause and effect. We know, for example, that the passage of a law is not a fortuitous event and usually reflects the temper of the times. For example, some have maintained that many legislative acts of this sort are passed after the restrictions they impose are already a fait accompli. Were there enough forces in motion prior to 1964 so that, had the act not been passed, relative economic status of nonwhites would have been markedly inferior? Thus, for example, the status of nonwhite women had achieved parity long before 1964, and there were marked differences in status of males across regions. On the other side, it is true that equal opportunity employment agencies have revolutionized employment and personnel practices of large corporations at the present time; yet there still remains a question regarding the extent of their effects in the mid-sixties. In other words, there is a simultaneous equations problem of a most unusual and difficult sort here that remains to be completely analyzed. Whatever the answers might ultimately be, it is clear from this study that black economic progress has been concentrated among younger workers, has increased the value of family background, and has not benefited experienced black workers very much. Why these patterns should have emerged, whatever the effect of the Civil Rights Act, also remains a researchable subject of importance.

Herschel Grossman and Warren Trepeta present a theoretical model that attempts to account for racial differences in earnings stability over time, using a sophisticated variant of the theory of discrimination. Their model is based on the most modern research on unemployment, to which Grossman has been a major contributor, wherein risk-averse workers shift cyclical earnings risk to owners of firms, who are less risk averse or who can diversify through superior portfolio management. The nature of this type of labor contract is to equate earnings and marginal product over an extended time horizon, but not necessarily at every moment in time. Instead, the worker is paid less than marginal product when the state of demand is high, representing the equivalent of an insurance premium, to be paid back as an indemnity in the form of a wage in excess of marginal product when the state of demand is low. In this way the worker's income

is stabilized, and there are gains from trade arising from differential risk aversion of employer and employee.

The difficulty of implementing an earnings stabilization scheme of this sort is that one or another party has an incentive to cheat on the arrangement, depending on the state that is realized. For example, when demand for labor is increasing elsewhere in the economy, a worker who is presently paid less than marginal product at some firm has incentives to renege on his "insurance contract" by jumping to a firm that is paying high current wages in the "spot" market. Similarly, firms have incentives to lower wages in low states of demand in the presence of a pool of available alternative unemployed workers, though Grossman and Trepeta assume that the future value of the firm's reputation is sufficient to keep it honest. A worker who does not cheat is called reliable. They assume that different types of workers have different tastes for reliability, which is tantamount to assuming rising supply price of workers cheating on insurance contract terms. The analytical achievement of this paper is to ascertain the general equilibrium insurance contract in the presence of this moral hazard problem. Workers tend to be highly unreliable if there is too great a divergence between the insured wage and opportunity wages, since the returns on leaving the firm rise in that case. Therefore, full insurance is not an equilibrium outcome in this world. Instead, the market equilibrium balances the demand for insurance by risk-averse workers against the supply of it in terms of actuarial imbalances which differential worker reliability might imply. It follows immediately that less insurance, i.e., greater earnings instability, must result when workers are less reliable, because the costs of providing insurance rise and less is purchased (assuming here some regularity conditions on income effects of price changes on the demand for insurance, as is usually necessary in problems of this sort).

A model of statistical discrimination is then appended to this structure whereby employers have different beliefs about reliability of different identifiable groups in the population. Grossman and Trepeta demonstrate that these beliefs can become a self-fulfilling prophecy even if untrue in certain circumstances of the model, which is capable of multiple equilibria. However, as pointed out toward the end of the paper and more forcefully by Dennis Carlton in his comment, multiple equilibria, supporting thoroughgoing statistical discrimination, are possible only in cases where employers are not completely informed of the influence of their own wage policy on the reliability of their own specific work force. Such information would eventually erode statistical discrimination not supported by real differences among groups, though the differences might persist for some time, depending on the speed of learning.

I would add two further points. While it is true that those who discriminate must pay the price in the form of higher wage bills and consequently lower profits, there is no inherent reason why discrimination should

vanish so long as the number of potential discriminators is large, because discrimination, by hypothesis, is a “good” for such people and is another argument of their utility function. Second, although Grossman and Trepeta do not particularly develop the point, their model appears to be useful in explaining differences among groups due to objective factors of taste or opportunity differences among groups. These points remain to be developed. For example, discrimination in the market for specific human capital accumulation would tend to make blacks appear less reliable than whites. Young workers might have different attitudes toward risk than older workers, if for no other reasons than that the two groups have different family responsibilities and structure. These and other related points remain to be developed.

### **Labor Market Information and Investment**

In his paper “Signaling, Screening, and Information,” Michael Spence provides a survey and some very suggestive ideas for extending the basic model of signaling that he has been instrumental in developing. The basic idea is that when personal productivity is not directly observed but is known to be correlated with observable but endogenous variables such as schooling, individuals have incentives to invest in signals as indicators of personal productivity. This is true whether or not these investments increase actual productivity, so long as they are correlated with perceived productivity. Of course, if the signals are sustainable, perceived and actual productivity must match up in the final equilibrium, for otherwise the wage-signal relationship established in the market would unravel owing to profits or losses by firms. A signaling equilibrium is viable if those who are truly more able in the productivity sense are also more able in the investment sense of being able to purchase the signal on more favorable terms than others. Since the signal is relatively cheaper for more capable individuals, they purchase more of it and earn higher pay supported by their higher inherent market productivity. Indeed, that is the only way they can reveal their productivity to the market.

Spence begins by contrasting the signaling, human capital, and job-rationing models from the point of view of the relationship between earnings and schooling. He shows in a very simple way what is becoming increasingly well understood, that it is very difficult to distinguish among these various hypotheses at a very general level, since each model basically has the same behavioral implications. There are of course important normative differences among them, but it is clearly never possible to assess divergences between social and private productivity on the basis of earnings data alone. This identification problem is particularly well displayed in John Riley’s comment, which illustrates the differences in the models with the standard Wicksellian optimal-stopping apparatus. The

only difference is shown to lie in a few tangency conditions, and these are not directly revealed by data alone. Spence presents an interesting formulation of the rationing model, whereby productivity resides in the job to which a person is assigned rather than in the person himself, but he does not pursue it very far. This is an old idea in labor economics that has not received as much attention as it probably should and that perhaps could be developed much further than Spence does here.

In the simplest signaling models, it is assumed that unobserved productivity or ability is perfectly correlated with the costs of investing in the signal. Here, Spence relaxes the perfect correlation assumption and allows the signal to be noisy. On the average, persons with greater ability in the market can also purchase the signal on more favorable terms, but at the same time there exist individuals who are very able and who also find it relatively expensive to purchase the signal. This corresponds to the same kinds of analysis as are found in the human capital literature, where, for example, capital market imperfections make it difficult for some people to borrow and finance investment in schooling. Consistent with the identification problem noted above, the behavioral consequences and welfare distortions introduced thereby are not dissimilar to those that come from the human capital model. Spence next uses this model to show the difficulty of identifying the schooling-income productivity effect even when measures of ability are available. The chief difficulty appears to be that even if the ability indicator actually used were orthogonal to schooling, it cannot clean out the effect of signaling on schooling because the schooling effect on earnings always contains both productivity and signaling effects. Indeed, from his discussion it appears as if only the sum of the schooling-human capital and schooling-signal effects is identified and not each one separately. While this result depends on the particular example used by Spence, it brings us back to the original point: how does one choose between nonidentified models when important normative issues are at stake?

Spence also shows that his model leads to no definite predictions concerning the schooling-earnings relationship among the self-employed versus a screened sector, so that tests based on these presumed differences, even if it could be assumed that the self-employed do not signal, which is doubtful (think of why doctors so prominently display their credentials), would not necessarily be conclusive. Finally, Spence analyzes the effects of contingent contracts as a solution to the signaling-asymmetrical information problem, as well as some effects of licensing. A contingent contract is shown to solve the signaling problem in the sense of offering an alternative arrangement that removes the overinvestment inefficiency of signaling. However, in his interesting comment, Charles Wilson demonstrates that there may well be an adverse selection problem with contingent contracts when there are capital market imperfections

that make it difficult for workers to borrow on terms as favorable as those available to firms.

One feature of the signaling model that appears to be artificial for many labor economists is the extreme assumption of asymmetrical knowledge, i.e., that workers know exactly who they are but firms have no information other than the signal. It is clear, however, that a great deal of job turnover and search activity engaged in by workers, if not school experiences themselves, is for the sake of acquisition of information about their own skills, tastes, and opportunities. In their paper, Ross, Taubman, and Wachter (RTW) begin to analyze how sequential job assignments might convey information about personal productivities of workers. While the scheme they consider would tend to collapse in the case of extreme asymmetric information, owing to the possibility of contingent contracts, it becomes more interesting in the case where information is equally poor on both sides of the market. Thus, in distinction from the extreme signaling model where schooling has no effect on productivity, the process envisioned by RTW actually yields a productive service to society in slotting people into the correct job.

As RTW set up the problem, a person of type  $i$  on job type  $j$  produces an output  $a_{ij}$ . At the time of initial hire neither the firm nor the workers have information on what types the workers are, but there is prior information on the probabilities of each type in a given group of workers. Hence the optimum strategy is to assign everyone to the one job with highest expected value. After the job assignments are made and output is revealed, information becomes available on the quality of the match for each person, which then yields conditional information on the worker's type. Given that information, new assignments are made, output is revealed again, and more information is yielded about the worker. With competitive labor markets, the wage paid at each step of the process must be the conditional mean productivity (conditional on the information revealed in previous steps). The main conclusion that RTW draw from this is that the wage of each person must tend to increase over the life cycle. This obviously must be true if the sorting process is productive and actually yields information that increases total output by better matching of different types of workers to different kinds of jobs. Although RTW contrast their conclusion with the conventional one that, for example, comes from an on-the-job training model, it strikes me as rash to over-stress the conceptual differences: in both cases the process can be described as one of capital accumulation, in the training case the actual learning of skills and in the sorting case the learning about latent skills and comparative advantage.

There are a host of implications yet to be obtained from this way of looking at the problem, which in a formal sense is a variety of optimal-stopping, dynamic-programming problem. Wilson's comments show that

the optimum assignment policy depends on the length of the remaining horizon and also on the dispersion of productivities. The latter is closely related to the amount of information obtained from a given assignment. In fact, it seems that if the horizon were long enough, it is not necessarily optimal to assign workers to the job that maximizes expected current product. There might be another job that actually yields more information—lower current expected product, but larger lifetime product through the more efficacious matches it allows later on. Evidently workers would be willing to pay for these kinds of changes if the matching information resides in them. Clearly there is a lot of useful economics yet to be done on this problem.

## Note

Though all papers were assigned formal discussants at the conference, only selected comments appear in the published volume. This reflects the intensity of preferences of the discussants themselves, and no editorial judgment is implied or intended.

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