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HIRING PROCEDURES IN THE FIRM: THEIR ECONOMIC DETERMINANTS AND OUTCOMES

Harry J. Holzer

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ABSTRACT

This paper presents an economic analysis of recruitment and screening procedures chosen by firms as they hire new workers. After reviewing the relevant literature within the labor economics and human resources fields, I outline an employer search model in which firms choose hiring procedures as well as reservation productivity levels. The outcomes determined by these choices (e.g., expected vacancy durations, expected worker productivity and characteristics, and total resources devoted to hiring) are considered as well.

I then present some empirical evidence on the determinants and outcomes of hiring procedures from a survey of firms. Among other things, the results show some evidence of higher productivity and lower turnover among those hired through referrals from current employees. Total time spent on hiring when using these referrals is also shown to be lower than when other methods are used. However, those hired through these referrals are less likely to be young or female than are those hired through other methods. The implications of these findings for "efficiency" and "equity" considerations are then discussed.

Harry J. Holzer
Department of Economics
Michigan State University
E. Lansing, MI 48824

Hiring procedures in the firm generally consist of two sets of activities. One set involves recruitment of applicants, while the second set involves screening and selection from among these applicants. Recruitment activities often include the soliciting of referrals from current employees or other employers, posting "Help-Wanted"signs,placing ads in newspapers and obtaining referrals from a variety of institutions (e.g.,state or private employment agencies, schools,community agencies, etc.). Screening activities often include written applications, interviews, physical exams, cognitive/dexterity tests, and reference checks. Probation periods can also be considered part of the screening process.

These hiring procedures have been discussed and analyzed at great length in the personnel/human resources literature. However, there has been far less research on these issues within the labor economics literature of recent years. This paucity of attention is somewhat surprising, since a voluminous literature on has been developed on the topics of "job search" and "job matching" in the past two decades. Recent search models have emphasized search by employers as well as employees and the problem of finding jobs for which individuals are best-suited in terms of their productivity. However, these models rarely focus on the specific activities which constitute search by employers; instead they deal primarily with time and resources spent searching, or with "reservation" (or minimally acceptable) productivity levels. Empirical work on any part of the employer search process has been particularly scant.

The lack of attention paid to hiring procedures by economists is also surprising given the potentially important

economic effects which these procedures are likely to have. For a given amount of resources devoted, the choice of recruitment and screening strategies may help to determine the length of time it takes to fill a job - i.e., the duration of the vacancy - as well as the characteristics of the individual who ultimately fills the slot and thus his/her performance there. Not only are these effects important from the point of view of a firm which is (presumably) trying to maximize its profits; they will also have major implications for unemployment and the distribution of job opportunities in the labor force. Thus, both efficiency and equity considerations imply a need for economists to explore these issues more fully.

In this paper I hope to expand our knowledge of the economic determinants and effects of hiring procedures in the firm. There are three principal aims in this work: 1) To review and assess the literature on hiring procedures in labor economics and personnel/human resources; 2) To provide an economic framework within which hiring procedures can be analyzed and which might bridge the wide gulf that currently exists between labor economics and personnel/human resources on this topic; and 3) To provide empirical evidence on the determinants and effects of these procedures. The evidence is based on data from a 1982 phone survey of about 3500 firms nationwide that was developed by the National Center for Research on Vocational Education (NCRVE) and administered by Gallup, Inc.

The analysis of these data shows that recruitment choices by firms appear to have important effects on both job performance and

demographic characteristics of those hired. In particular, referrals from current employees and other employers produce new hires with higher performance ratings and less turnover than do other recruitment methods. However, these strategies are less likely to produce employees who are young, female, and have less experience. Apparently these groups have fewer "connections" among current employees or have greater difficulty obtaining information and references from them. The reliance of employers on these referrals may therefore be detrimental to those who already have some disadvantages in the labor market. In a sense, these recruitment strategies may be creating an "efficiency-equity" tradeoff for firms who use them.

The rest of the paper contains four sections. The first presents a review of the literatures in both labor economics and personnel/human resources which are relevant to hiring procedures. While the effort expended on this topic has been greater in the latter area, the economics literature provides with some institutional perspectives as well as some recent theoretical work which can be extended to deal with hiring procedures.

The second section presents one such model that deals with employer search.The implications of this model for both determinants and outcomes of hiring procedures are discussed.

The third section then presents empirical evidence on these procedures. Equations are estimated which attempt to explain both the choices of procedures as well as their effects on perceived performance, turnover, and demographic

characteristics of employees. Other outcomes such as vacancy durations are also considered here.

The fourth section presents a summary of the findings and implications for future research.

I. A Review of the Relevant Literature

Two distinct bodies of literature are relevant for any discussion of hiring procedures in the firm: that from labor economics and that from personnel/human resources. While the latter frequently is directed at the practioner rather than the academic, a good deal of academic research has been done in both areas that can be discussed here.

Of course, the fields of labor economics and labor relations (including personnel) were not always so distinct as they are today, and much of the work done during the 1940's and 1950's by labor economists has been influential in both areas as they developed more independently in the 1960's and beyond.[1]

A. Labor Economics

With regards to hiring procedures, important contributions were made (among others) by Lloyd Reynolds in his 1951 classic, The Structure of Labor Markets. In that volume, Reynolds stressed the limited information which potential employers and employees have about each other in the labor market. Certain informal methods of recruitment, such as those which rely heavily on current

employees for dissemination of information to friends and relatives, might provide more accurate information to the employer at a lower cost than would other approaches. This theme would again be stressed by Albert Rees (1966). He compared the use of "informal" recruitment with more "formal" methods, such as the State Employment Service, and often found the former preferable from an informational point of view. The Employment Service was also seen as being plagued by problems of stigmatization of referrals and lack of genuine interest on their part. Thus Rees responded to critics who chided employers for not relying more heavily on the formal methods and who advocated greater public expenditure on these mechanisms.

As for empirical work in this area, early papers by Malm (1954,1955) contained survey information on recruitment sources and their effectiveness. More recent work by Reid (1972) for the UK and by Datcher (1983) for the US confirmed the notion that employee referrals generated other employees with higher productivity and/or lower turnover. Various reports by the Bureau of National Affairs and by the Department of Labor presented a broader range of data on the use and perceived effectiveness (by employers) of these and other recruitment strategies.[2]

A somewhat different strand of literature which generated interest among economists in these issues began with Clark Kerr's "The Balkanization of Labor Markets" in 1954. The notion that markets for particular occupations and localities were "Balkanized" (or segmented) implied that competition for various jobs was highly imperfect, and that access to many attractive jobs would be limited by information and location as well as skills. The central role of

personnel "rules" as opposed to market forces for determining employment outcomes and opportunities was stressed by Kerr and many who followed him.

Among the latter, the work of Doeringer and Piore (1969) extended this notion by their work on internal and dual labor markets. If training, promotion, and other activities were handled internally by firms, then access to such an "Internal Markets" becomes the crucial determinant of job opportunities for various groups and individuals. Recruitment and screening procedures of firms determine this access. Furthermore, certain procedures (e.g., recruitment through employee referrals, screening through interviews and tests, etc.) may create disadvantages for minorities (or women) which block their entry into "Primary" markets and leave them disproportionately represented in "Secondary" markets."[3] Thus the firm's hiring procedures can have distributional implications as well as effects on employee performance discussed above. While the empirical work on internal and dual labor markets has been controversial,[4] the notion that hiring procedures may create discriminatory problems seems less contested.

The aforementioned literature, stressing institutional features of labor markets and limited competition, has received less attention by labor economists of recent years who give greater priority to formalization of models and market forces. An important area which is relevant here is the literature on job search. Beginning with Stigler (1961) and developing with seminal pieces by Mortensen (1970) and McCall (1970), the search literature grew rapidly in the 1970's in an effort to explain cyclical and secular

unemployment trends. Throughout that decade, search models focused almost exclusively on the activities and choices of individual, prospective employees - namely, their choices of reservation wages (i.e., lowest acceptable wages) and search effort.[5] However, the last five years have seen the development of search models which incorporate employer behavior as well. These models, including those of Pissarides (1984) and Axell and Albrecht (1984) often posit that employees choose recruitment and selection time, advertising expenditures, reservation productivities and sometimes wages. However, the exact procedures by which applicants are generated and productivities are inferred are usually left unspecified.

As for empirical work on employer search models, a series of papers by John Barron and John Bishop stand among the only attempts to test some implications of these models. Not only have they focused on total search time and time per applicants for employers;[6] they also have considered how specific recruitment procedures affect applicant flows and employer profits.[7] The empirical work reported below extends their work on the same data.

A few other groups of economics models should be briefly mentioned before moving to the personnel literature. The early 1970's saw the development of several models seeking to explain discrimination in a way which did not depend on employer tastes, as did Becker's model.[8] These models include the statistical discrimination or screening models of Arrow (1972) and Aigner and Cain (1977), as well as the signalling model of Spence (1973). All of these models stress that race, sex, or even education may be viewed as proxies for true productivity, which is itself too costly to measure.

Although some of these models have been criticized for not allowing employer learning over time, they do suggest that procedures which are cost-effective from the employer's point-of-view may disadvantage individuals with particular characteristics.[9] Such a possibility is considered below.

Finally, some other recent economic models of "personnel issues" deserve mention. Work by Edward Lazear (1979) and others suggests that it may be optimal for employers to create earnings profiles over time which deviate from productivity profiles.[10] These models essentially depict the working of internal labor markets, in which firms and workers have long-term attachments. Furthermore, the recently popular implicit contract and efficiency wage models of business cycles similarly imply long-term attachments and wages deviating from market-clearing levels.[11] All of these models suggest that the process by which some individuals are chosen for these long-term arrangement while others are not may be crucially important for understanding the performance of individuals in these firms and the distribution of jobs across people.

B. Personnel

We now move to the literature within the personnel/human resources framework. Unlike the models of labor economists, the personnel research has focused on the effects of specific recruitment and selection procedures. Some models have also been developed which are close to those of economists in capturing firm considerations when hiring. Several authors have considered the effects of different

recruitment channels on the ultimate performance of employees hired. Recent contributions include papers by Breaugh (1981),Schwab (1982), Taylor and Schmidt (1983), and Hill (1970). Most continue to find that employee referrals generate individuals with higher perceived performance and/or lower turnover, though the exact effects may also depend on additional factors such as morale among the employees and their closeness with those being referred.

Theoretical models have also been developed which attempt to capture the benefits and costs of various recruitment strategies and selection mechanisms from the employer's point-of-view. Often referred to as "Utility" models, they incorporate the effects of various methods on both the mean and variance of value generated by employee services, employee turnover, costs and accuracy of predictions generated by such mechanisms, etc. Boudreau and Rynes (1985) is a recent example of such work.

Another major strand of this literature reviews the results of tests for the "validity"or "reliability"of selection procedures. These issues are of interest to employers seeking cost-effective hiring procedures, as well as to minorities and other groups whose performance as predicted by various selection techniques may be relatively low. In fact, Supreme Court interpretations of the Equal Employment Opportunity Act require employer validation of tests and other selection procedures which may impair the employment of minorities and other groups.[12] Reviews or analyses of selection technique validity have been done by Lilienthal (1980) for reference checks, Karren (1980) for the selection interview, and Globerson

(1968) for probationary periods. Their results, especially for reference-checks and interviews, show questionable validity which may be raised by standaridized formats and structure as well as training for the personnel officer.

Other articles have sought to define or clarify the criteria for "fairness" in cases where either test performance or test validity differ across racial groups. Steffy and Ledvinka (1986) have run simulations of employment outcomes using a variety of equal opportunity definitions, while Hunter and Schmidt (1982) and Schmidt et.al.(1973) have questioned the evidence on differential validity of various tests across racial groups.

Despite these articles,little has been done to analyze differential effects of recruitment procedures on racial, sexual, and age groups. Furthermore,a wide gap remains between the perspectives of the economics and personnel literatures on these issues. The economists' search models might specify total time or resources allocated to hiring but rarely consider specific hiring methods and their economic effects. On the other hand, the studies in the personnel literature provide the evidence on specific methods but rarely present a broader framework within which to analyze them. Even the utility models in this literature do not go beyond the perspective of the employers and capture features of the labor market which influence their choices (such as skill levels of the labor force) or reflect them (such as the well-being of minorities or women within the labor force). Nor do these models fully capture the tradeoffs facing the employer in terms of vacant jobs and newly hired workers with varying degrees of skill.

Thus there exists a need for models which bridge the gap between labor economics and personnel on this issue, incorporating the contributions which each area has made to the analysis of hiring procedures. There also remains a need for more empirical evidence on how these procedures are chosen and on their effects for both the firm and the labor force. The work reported in the next two sections will hopefully contribute to the meeting of these needs.

II. An Economic Model of Firm Hiring Procedures

The following is an outline of an employer search model in which the firm chooses its hiring policies and a reservation level of perceived productivity in the job applicant when hiring for a particular vacancy.

The firm maximizes its expected profits in the following manner:

$$1)\ \max E(Profit)_t = P_{Hire,t} * E(Profit \mid Prod^r) + (1 - P_{Hire,t}) * E(Profit)_{t+1} - C_{Hire,t}$$

where $E(Profit)_t$ is the expected (discounted) profit stream which flows from the job in question at time t; $P_{Hire,t}$ is the probability of hiring someone to fill the position during this period; $Prod^r$ is the reservation (i.e., minimum acceptable) level of productivity chosen by the firm; and $C_{Hire,t}$ is the cost of the hiring procedures used by the firm during that period.

Equation 1) posits that the firm incurs hiring costs during

this period and faces two options: hiring an individual with productivity as least as high as $Prod^r$ and thus benefitting from a stream of profits which begin in this period; or not hiring anyone who meets the minimum standard and thus facing the same problem next period. The value of each option is weighted by the likelihood of that option occurring, once the hiring costs have been incurred.

In this formulation, the likelihood of hiring someone to fill the vacancy in this period should depend on the quality and number of applicants, the likelihood that an offer will be made, and the likelihood than it will be accepted.

The number and quality of applicants should depend on the characteristics of the local labor supply, such as skill mix; the wage and training policies already chosen by the firm; and the number of times each of several recruitment procedures is used. The likelihood of making an offer depends on the distribution of productivities available to the firm among its applicants as well as the firm's reservation productivity. The firm's ability to accurately guage the productivity of its applicants will depend on the number of times each of several selection procedures is used. The likelihood of the offer being accepted then depends on the applicant's own reservation wage and the distribution of wages available to him or her in the local market.

If the vacancy is filled, the expected stream of profits which the new hire generates will depend on the product price for the output produced , the wage paid, and the expected productivity of the hiree.

Finally, the costs of hiring procedures should depend on the unit costs of using each recruitment method and each selection method as well as the number of times each of these methods are used. The unit costs, in turn, should reflect salaries of personnel department employees and time-intensities of the methods as well as the direct costs incurred in each activity (e.g., costs of advertisements, etc.).

The intuition behind the model is based on the idea of tradeoffs between the costs of using various hiring procedures and the benefits which they generate in terms of filling a vacancy and obtaining a new hire with high expected productivity. The costs and benefits of using a particular procedure will vary across firms and industries and also across jobs within a firm. For instance, recruiting through current employees is a low-cost method which, according to the claims made in the literature (e.g., Reynolds, Rees, Breaugh, Schwab, etc.), should generate applicants in whose productivity the employer can be confident. However, this method may not be sufficient for jobs with more advanced educational and skill requirements. In such cases, the higher costs of newspaper ads, professional employment agencies, etc. may be justified. Legal constraints (from Equal Opportunity policies, etc.) may also lead the firm to rely more heavily on these other methods. The need to incur recruitment costs may also be affected by firm characteristics such as size and union status, since large and/or unionized companies might generate a large applicant flow independently of the hiring activities which they undertake. In these cases, direct walk-ins might generate sufficient applicants for low- or medium-skill jobs. The skill level needed for the job should also

determine a firm's willingness to use the State Employment Service and the screening mechanisms (e.g., interviews, probationary periods, etc.) which it undertakes.

It should be noted that choosing wages and training procedures entail similar costs and benefits, since the costs of high wages and/or training might lead to more applicants attracted and better qualifications. In this model, however, these are longer-term decisions taken as given in the short-run.[13] Once chosen, however, the wages and training that accompany a job should also influence recruiting and screening strategies. It is possible that high wages and training might serve as substitutes for hiring procedures by generating a large number of high quality applicants. On the other hand, if high wages and training reflect the skill needs of the job they may serve as complements for strategies which are more useful in screening applicant quality.

Choosing reservation productivity also entails a tradeoff. The choice of a higher level lowers the probability of hiring someone this period and thus postpones the stream of profits which filling such a job can generate. But a higher reservation level also leads to a higher expected level of productivity and profits when the vacancy is filled.

Once the hiring procedures and reservation productivities are selected, a number of expected outcomes are also determined. Two important ones, the expected productivity and profit generated by the new hire, are noted above. Others include the expected duration (in number of periods) of the vacancy and the total time spent recruiting and selection. The former is the reciprocal of the

probability of being hired in this period, while the latter is the sum of hours spent on each method.

It should be remembered that this model assumes profit-maximizing behavior on the part of firms and full information with regards to the benefits of different methods and the characteristics of their local markets which determine them. If these assumptions are not met, we might expect firms to engage in hiring procedures that are not totally optimal from their point of view. Learning over time should move them closer to such optimal behavior but may not totally eliminate some of the discrepancies (especially from non-profit-maximizing behavior on the part of personnel department employees).

We also note that the outcomes listed above represent the firm's point of view, and might be classified as "efficiency" outcomes by the economist. A different category, "equity" outcomes, should also be of concern.[14] In particular, the proportions of minorities, women, and young people hired to various jobs can be viewed as socially important outcomes of the firm's search choices. These proportions may be influenced by hiring procedures, simply because different groups in the population find different methods of search more or less productive and more or less costly, given their own characteristics. For instance, evidence that young blacks are particularly disadvantaged in the use of friends and relatives or direct applications from walk-ins appears in Holzer (1986). The disadvantage of using friends and relatives might be caused by a variety of forces, such as the absence of employed individuals in welfare homes; past discrimination, which leads to underrepresentation of blacks in many fields; and generally high

unemployment rates in many black neighborhoods. Similar problems may occur for women, the young, or other minorities.

However, these disadvantages facing particular groups will generally not be internalized by the firm, even if they are not explicitly discriminating. If the "signals" used by employers reflect their own misperceptions of ability and therefore have discriminatory content, the problems are exacerbated. Thus, both the "efficiency" and "equity" outcomes of the firm's choices of hiring procedures must be considered in any analysis of these issues.

III. Empirical Evidence on Hiring Procedures

In this section we present empirical evidence on the hiring procedures of firms. Two types of issues are considered: 1) The determinants of a firm's hiring activities; 2) the effects of these activities on observed outcomes, incorporating both efficiency and equity effects.

The data used for the analysis are part of a survey designed by the NCRVE and administered by Gallup, Inc. to 3500 firms in 1982. The survey was a followup to one administered to firms in 1980 as part of the government's analysis of the Employment Opportunity Pilot Project(EOPP).

Both surveys, and especially the latter, focused on the firm's recent vacancies and hiring procedures, as well as the characteristics and performance of some recently hired employees.[15]

In particular, the 1982 survey asked what activities the firm had undertaken in the past 10 days to recruit workers. They included

soliciting referrals from current employees, posting "Help-Wanted" signs, contacting the State Employment Service, placing ads in newspapers, etc. The survey then inquired about the number of phone calls, visits, and applications it had, and how many vacancies it filled during that time. Other characteristics of the firm (e.g., size, union status, industry, sales volume, turnover rates, etc.) were also noted.

A different section of the survey asked about the most recently hired employee of the firm. Various characteristics of that individual were noted, such as age, sex, and relevant working experience. Other characteristics of the individual's performance on the job were also gauged, such as whether the individual was still employed, whether he or she had been promoted, and the employer's perception of his/her productivity on the job at various points in time. For this last item, the employer was asked to rate the individual's performance on a subjective scale from 0 to 100. The same questions were asked for a "typical employee" as well, for comparison sake. The procedures by which this individual was recruited were also noted, as were the use of probationary periods and reference checks in screening the applicant. The percentage of applicants interviewed, the total time spent recruiting and screening, and the duration of the vacancy (both planned and total) are noted as well.

Using these data, we can present summary data and equations for the choice of hiring procedures and also for the effects of these choices. In particular, we provide estimates below for the following general equations for the l-th firm and the i-th individual:

2) $RM_{j1}, SM_{k1} = f(X_1, W_1, TR_1) + e_{2S}$

3) $Prod_{i1}, Turn_{i1}, Prom_{i1} = f(X_1, W_1, TR_1, X_{i1}, RM_{j1}, SM_{k1}) + e_{PT}$

4) $X_{i1} = f(X_1, RM_{j1}, SM_{k1}) + e_X$

5) $DV_1 = f(X_1, RM_{j1}, SM_{k1}) + e_D$

6) $TRS_1 = f(X_1, RM_{j1}, SM_{k1}) + e_T$

where RM_{j1} and SM_{k1} represent the hiring procedures mentioned above, the X_1 represent firm characteristics, W_1 and TR_1 are choices of wages and training by the firm, $Turn_{i1}$ represents whether the newly hired individual has left the firm, $Prom_{i1}$ is whether the individual has been promoted, $Prod_{i1}$ is the employer's subjective performance rating of the individual, X_{i1} are individual characteristics (i.e., age, sex, and experience), DV_1 is vacancy duration and TRS_1 is total time spent recruiting and screening. The productivity variable appears in its absolute form as well as relative to that of the "typical employee" (i.e., New hire productivity minus "typical employee" productivity), since the latter term would remove the tendency of some managers to rank all of their employees higher or lower than average.

Equations 2) can be interpreted as the employer choice equations, based on the model presented above; while Equations 3)-6) represent the various effects of these decisions. In particular, Equations 3) represent efficiency outcomes and Equations 4) equity

outcomes, while Equations 5) and 6) represent other outcomes that are closely linked to employer choices about hiring procedures and the costs they entail to the firm. The overall model is recursive in nature, with choices affecting outcomes but not vice-versa.[16]

Table 1 presents summary evidence on the use of hiring procedures by the firms. The upper half of the table shows the percentages of all firms with at least one vacancy during the last ten days who have used each of the major recruiting methods during that period. The bottom half of the table shows the percentages of firms that recruited their most recently hired employee through each method, and that used each of the particular screening mechanisms in the hiring process. All means are weighted by sample weights to correct for the oversampling of large, low-wage firms in these data.

The results show announcements to current employees as being the most frequently used recruiting method, followed by newspaper ads. These frequencies are lower in most categories than those which have previously appeared in the BNA reports described above.For instance, the 1979 survey on recruitment reports over 90% of companies using employee referrals, over 80% using walk-ins, and over 60% using the Employment Service. However, the participant companies in that survey were highly non-random, with an over-representation of large firms in manufacturing. The questions in the BNA survey also dealt with general hiring (i.e., over all jobs and time periods) rather than specific vacancies in a particular period. Still, the relative rankings are quite similar between the two surveys.

The results also show that over 43% of the new employees

Table 1

Use of Recruiting and Screening Methods

A. Last Ten Days - Firms with Vacancies	
Percentage of Firms Using:	
Announcements to Current Employees	.528
Help-Wanted Signs	.142
Newspaper Ads	.372
Employment Service	.201
Union/Private Agency	.218
Other	.259
B. Most Recently Hired Employee	
Recruited through:	
Current Employee (Friend/Relative)	.359
Walk-In	.186
Newspaper Ad	.132
Employment Service	.026
Other Employer	.070
Friend/Relative of Employer	.076
Other	.150
Screened through:	
Physical Exam	.085
Probationary Period	.639
Interview	.830
Reference Checks	.518

Note: All means are weighted by sample weights.

are recruited through friends and relatives of either the employee or employer. Direct walk-ins and newspapers together account for over 30%, while the Employment Service provides only about 2.5%.

It is important to remember that the frequencies in part A reflect only the employer's frequency of use for each method, while those in Part B reflect both use and effectiveness in generating an acceptable employee - i.e.,all of the factors which are part of Equation 1) above. The high fraction of recently hired employees generated through friends and relatives in Part B thus suggests that its effectiveness is higher than those of other methods as well as its relative use. In addition to being a recruiting method of low cost, the use of friends and relatives appears to generate information regarded by employers as reliable and informative about prospective applicants, as argued decades ago by Reynolds and Rees. Whether or not these beliefs are borne out by employee performance will be analyzed below. It is also noteworthy that the Employment Service generates far fewer employees than one might expect from its frequency of use. In this case, a low-cost method seems to be effective in only a very limited number of cases. This is also consistent with the observations of Rees and others. But the low-cost method of direct walk-ins and the higher cost method of newspaper ads generate more substantial numbers of employees.

As for screening methods, we see that interviews are used by about five out of every six employers in screening its applicants. Despite questions about its validity which are raised in the literature, employers seem to regard the interview as an important source of information about prospective employees.

Probationary periods and reference checks are used by over half of the firms, while only about one in twelve uses physical exams. These numbers are substantially lower than comparable ones in the BNA (the 1976 selection report shows over 90% of firms checking references and 74% giving physical exams). But, again, the relative rankings are quite similar between these two surveys.

Tables 2 and 3 present estimates for Equations 2) above, in which recruiting and screening methods used for the most recently hired employee appear as the dependent variable. The independent variables include industry dummies, employer size, percent of employees unionized, number of openings available in that position, education dummies of the individual hired (which presumably reflect skill requirements for the job), current wage of employees in that position, and total hours of training by the individual.[17] These variables are chosen to reflect exogenous characteristics of the job, firm, and industry that should determine the firm's ability to generate applicants through each method, given its needed qualifications. The wage and training variables, in particular, may be picking up part of the skills needed which go beyond education level. They also represent alternative, long-run policies to attract or generate skilled labor which may be either complementary with or substitutable for the hiring policies analyzed here.

The results of Table 2 for the recruitment procedures show only a very limited ability to explain these choices (as shown by R^2). Much of the unexplained variation may reflect the differences in jobs for which these individuals were hired or diferences in the firms

Table 2

Equations for Recruitment Method Used For Last Employee Hired

	Current Employee	Employment Service	Newspaper Ad	Walk-In	Employer Fr./Rel	Other Employer
Industry						
Manufacturing	-.011	.032*	-.063*	.059*	-.007	-.028*
	(.034)	(.013)	(.023)	(.032)	(.018)	(.017)
Transp.,Comm., Utility	.005	-.030	-.026	.095*	.020	.005
	(.055)	(.021)	(.037)	(.052)	(.042)	(.027)
Agriculture	-.318	-.027	-.126	.281	-.071	.433*
	(.335)	(.089)	(.158)	(.218)	(.124)	(.115)
Construction	-.006	.013	-.066*	.080*	-.008	-.013
	(.043)	(.016)	(.029)	(.040)	(.023)	(.021)
Mining	.015	-.028	-.070	.147*	.020	-.008
	(.079)	(.030)	(.053)	(.074)	(.042)	(.039)
W. and I. Trade	.005	-.003	-.037*	.064*	-.003	-.014
	(.024)	(.009)	(.016)	(.022)	(.013)	(.012)
Size	-.020*	.004*	.003	.010*	-.004	-.002
	(.005)	(.002)	(.003)	(.005)	(.003)	(.002)
Percent Union	.010	.002	-.002	.002	.003	-.006
	(.010)	(.004)	(.007)	(.010)	(.006)	(.005)
Numbered of Openings	.000	-.000	.002	.004	-.002	-.002
	(.004)	(.001)	(.003)	(.004)	(.002)	(.002)
College Education	-.124*	.012	.068*	.007	-.021	.017
	(.041)	(.015)	(.027)	(.037)	(.021)	(.020)
High School Education	-.038	.010	.049*	-.007	-.010	.007
	(.032)	(.012)	(.022)	(.030)	(.017)	(.016)
Current Wage of Employee in this Position	.008*	-.0015	.002	-.019*	-.001	.008*
	(.004)	(.0014)	(.003)	(.003)	(.002)	(.002)
Hours of Training	-.020	-.003	.001	.002	-.002	-.009
	(.024)	(.009)	(.016)	(.022)	(.013)	(.012)
$\bar{R}^2$	.016	.010	.011	.024	.003	.023
N	2153	2153	2153	2153	2153	2153

Note: Size of Firm measured in hundreds of employees; hours of training measured in hundreds as well. Omitted industry is service sector (including financial services). Equations estimated using OLS. Standard errors appear in parentheses and asterisks represent significance at or above the 90% level in this table and all which follow it.

themselves. Still, some interesting findings emerge. We find few significant industry effects for use of current employees, which implies that their use if very widespread across industries. This is consistent with th the previously stated belief that this method is low in cost and high in ability to generate useful information. Only larger firms and jobs for which the college-educated are hired use these referrals less frequently (or successfully) than do others. These presumably have more formalized personnel policies and/or require more specific skills than are generated through current employees.

The Employment Service is most heavily used in manufacturing and for low-wage jobs, consistent with findings by Rees and others about perceived quality of these applicants. Newspaper ads are used most heavily, and direct walk-ins least heavily, by the omitted service and finance category. Newspapers are used heavily for hiring the college-educated, while direct walk-ins are used mostly by large firms for low-wage jobs. The higher cost of newspaper advertising thus appears to be worthwhile for those seeking more specialized and skilled employees, while the low cost of using direct walk-ins makes them worthwhile for less-skilled positions and for firms which are likely to attract many applicants by virtue of their size. All of this is consistent with the model outlined in Section 2 above.

The results of Table 3 for determinants of screening nethods show that probationary periods are heavily used in manufacturing firms, large firms, and those jobs with long periods of training. The size and training effects, as well as high wages, also appear

Table 3

Equations for Screening Methods Used for Last Employee Hired

	Probationary Period	Physical Exam	Reference Check	Interview
Industry:				
Manufacturing	.090*	.104*	-.019	-.034*
	(.034)	(.023)	(.037)	(.021)
Transp.,Comm. Utility	.031	.157*	.050	-.074*
	(.055)	(.037)	(.058)	(.032)
Agriculture	.243	-.068	.444	.066
	(.312)	(.211)	(.337)	(.187)
Construction	-.180*	-.081*	-.180*	-.112*
	(.042)	(.029)	(.046)	(.025)
Mining	-.220*	.504*	.029	-.070
	(.080)	(.054)	(.087)	(.048)
W. and R. Trade	-.003	-.002	-.022	-.042*
	(.024)	(.016)	(.025)	(.014)
Size:	.013*	.021*	.018*	.003
	(.005)	(.003)	(.005)	(.003)
Percent Union	-.015	.002	.002	.008
	(.010)	(.007)	(.011)	(.006)
Number of Openings	-.003	.002	-.005	.002
	(.004)	(.003)	(.004)	(.002)
Number of Applicants per opening	.002*	.000	.003*	.0010*
	(.001)	(.003)	(.001)	(.0003)
College Education	.014	-.036	.065	-.008
	(.041)	(.028)	(.044)	(.024)
High School Educ.	.030	.010	.126*	.023
	(.032)	(.022)	(.035)	(.019)
Current Wage of of employees in this position	.001	.015*	.015*	-.003
	(.004)	(.003)	(.004)	(.002)
Hours of Training	.047*	.000	.056*	.017
	(.025)	(.017)	(.026)	(.015)
$\bar{R}^2$	.038	.135	.057	.027
N	1946	1946	1946	1946

NOTE: All equations estimated using OLS.

important for reference checks. In both cases, the costs of time-intensive screening methods may be more easily borne by large companies and more necessary for those jobs in which high wages and training will be invested. These screening methods thus appear somewhat complementary with these other, longer-term personnel choices.

As for physical exams, these are used primarily for less-educated but higher wage jobs, especially in mining, manufacturing and the utilities. Low-skilled but physically demanding jobs are likely to fall into these categories. Since interviews are performed by most firms, this method shows few significant determinants (except for a low level of use by construction contractors).

Overall, the results of the first three tables show that firms use a variety of hiring procedures, and that their choices at least partly reflect some of the underlying characteristics of jobs and firms in terms of skills needed and applicants available. Still, the low explanatory power of the equations estimated for these procedures shows that a great deal of unexplained variation in firm behavior remains.

In Tables 4 and 5 we turn to estimates of Equations 11) and 12) respectively for efficiency and equity outcomes. Table 4 presents results for four dependent variables: perceived productivity in the first two weeks of employment, both absolutely and relative to the "typical worker" in the job; and dummy variables for whether the individual is still with the firm or has received a promotion. Explanatory variables include the recruitment and screening procedures (with the "other methods" category omitted from the mutually exclusive

Table 4

Equations for Efficiency Outcomes of Using Hiring Methods

	Productivity		Relative Productivity		Still with the Firm		Received Promotion	
	1	2	1	2	1	2	1	2
Recruitment:								
Current Employee	2.25	1.26	1.77	1.28	.052*	.050	-.032	-.025
	(2.03)	(1.99)	(1.44)	(1.42)	(.035)	(.035)	(.037)	(.037)
Employment	-1.28	-2.45	.867	.383	.045	.039	-.018	-.006
Service	(3.70)	(3.63)	(2.62)	(2.58)	(.054)	(.064)	(.068)	(.068)
Newspaper Ad	2.36	.136	1.74	.367	.038	.026	-.068	-.050
	(2.55)	(2.51)	(1.82)	(1.80)	(.044)	(.045)	(.047)	(.047)
Walk-In	3.01	2.34	1.06	.742	.002	.000	-.025	-.021
	(2.13)	(2.08)	(1.51)	(1.488)	(.037)	(.037)	(.038)	(.039)
Employee Fr./Rel.	3.58	2.80	1.37	1.08	.023	.022	-.007	-.002
	(2.91)	(2.85)	(2.06)	(2.03)	(.051)	(0.50)	(.053)	(0.53)
Other Employer	5.24*	3.22	2.92	1.60	.063	.052	-.050	-.034
	(3.10)	(3.04)	(2.20)	(2.17)	(.054)	(.054)	(.057)	(.057)
Screening:								
Probation Period	-4.26*	-3.77*	-1.62	-1.32	-.036	-.034	.040	.036
	(1.47)	(1.44)	(1.05)	(1.03)	(.026)	(.026)	(.027)	(.027)
Physical	2.13	2.10	.353	.607	.008	.011	-.036	-.036
	(2.14)	(2.10)	(1.51)	(1.49)	(.037)	(.037)	(.039)	(.039)
Interview	-5.12*	-4.70*	-.288	.049	-.061	-.058	-.036	-.040
	(2.55)	(2.50)	(1.85)	(1.81)	(.045)	(.045)	(.048)	(.048)
Reference	-3.01*	-3.61*	-.547	-.912	.021	.017	.076*	.082*
	(1.44)	(1.42)	(1.027)	(1.011)	(.025)	(.025)	(.027)	(.027)
Personal Characteristics:								
Age		.258*		.074		.002*		-.004*
	-	(.077)	-	(.055)	-	(.001)	-	(.001)
Sex (Male =1)		1.276		-.501		-.022		.007
	-	(1.369)	-	(.978)	-	(.024)	-	(.026)
Experience in		.064*		.052*		.024		-.025
Position Previously	-	(0.13)	-	(.009)	-	(.023)	-	(.024)
$\bar{R}^2$	.039	.082	.016	.052	.016	.020	.027	.035
N	1618	1618	1576	1576	1703	1703	1699	1699

NOTE: Equations also include determinants of hiring policies for previous tables as independent variables.

set of recruitment dummies); as well as the underlying characteristics of firms and jobs which appear as determinants of these choices. Two versions of each equation are estimated: one with and one without the demographic characteristics of age, sex, and experience (measured in months) in this position appearing as independent variables. While these characteristics may be related to performance outcomes and should therefore by analyzed and controlled for, they may also be the channels through which hiring procedures affect performance. In this latter case, one would want to compare the effects of hiring procedures between these equations to see how much of their effect is captured by personal characteristics.

The results show that recruitment through current employees has a positive effect on employee performance for all measures except promotion. However, these effects are generally only marginally significant, and occur primarily in the equations where personal characteristics are not included. The inclusion of these characteristics in the perceived productivity equations lowers the effect of hiring procedures in a manner which indicates that a substantial part of the latters' effects work through the former. Employees who are recommended by other employers show a similar pattern of effects.

In spite of the low significance levels, these results are fairly consistent with those of several studies mentioned above and thus provide some support for the claims frequently made in the literature about the quality of information obtained from these sources regarding applicant qualifications. Their heavy use in hiring (as documented in Table 1) thus appears sensible from the employer's

point of view.

It is possible that employers view these candidates as being more productive simply because they had good references, though this would not explain the higher tendency of such candidates to stay with the firm. It is also possible that those who have friends and relatives in the firm perform better because of a supportive social environment. This latter possibility is not, however, inconsistent with the general observation that such new hires perform better on the job than do others.

As for screening procedures, we find generally positive effects of probation periods and reference checks on promotion but surprisingly negative effects on most other outcome measures. Interviews also have quite negative effects in most cases. The effects are much smaller in the relative productivity equations than in the absolute ones, indicating that a good deal of this effect may be subjective measurement error on the employer's part. Still, the persistence of negative effects in several cases may reflect either some statistical bias (e.g., omitted control variables which are positively correlated with selection procedures but negatively correlated with performance) or a failure of employers to be choosing the correct procedures (perhaps because of limited information, etc.). A different version of the latter hypothesis, which would be fairly consistent with the results of validation studies cited above, is that selection procedures are being used without sufficient structure or training for the personnel involved. Perhaps more refined measures of selection activities would show better results. In any

event, the interpretation of these results remain a puzzle at this time.

As for personal characteristics, we note that age and job-specific experience have positive and generally significant effects on all outcomes except promotion. Sex, however, has no significant effects here. The results on age and experience are consistent with much that has been written in economics within the "Human Capital" framework, which suggests that individuals acquire important skills from working on-the-job. [18] However, the possibility of discriminatory biases in judgment with regards to the young and inexperienced (as well as women) still remains.

In Table 5 we present the results for equations in which these characteristics are themselves the dependent variables. The independent variables are thus identical to those of the first specification of each equation in Table 4. The results show strong effects of recruitment methods on the demographic characteristics of workers hired. In particular, recruitment through current employees is likely to generate employees who are older, more experienced, and more likely to be male relative to the omitted category of "other methods" (which include schools, community agencies, professional publications, etc.) . Recruitment through other employers has similar effects on age and experience, as does the use of newspaper ads. However, the latter has a marginally negative effect on the likelihood of the employee being a male.[19]

As before, the effects of screening methods on demographic characteristics are a bit less clear. References raise age and experience but lower the probability of being male. Few of the

Table 5

Equations for Equity Outcomes of Using Hiring Methods

	Age	Sex (Male =1)	Previous Experience
Recruitment:			
Current Employee	1.49*	.084*	7.36*
	(.725)	(.034)	(4.33)
Employment Service	2.579*	.056	4.71
	(1.336)	(.063)	(7.96)
Newspaper Ad	3.290*	-.053	19.33*
	(.917)	(.043)	(5.44)
Walk-In	.889	.023	4.41
	(.760)	(.035)	(4.53)
Employee Fr./Rel.	1.02	.069	1.88
	(1.04)	(.049)	(6.20)
Other Employer	2.86*	-.026	17.57*
	(1.13)	(.053)	(6.66)
Screening:			
Probation Period	-.527	.000	-4.81
	(.532)	(.025)	(3.17)
Physical	.760	.129	-3.20
	(.769)	(.036)	(4.59)
Interview	-.920	.048	-4.18
	(.924)	(.043)	(5.57)
Reference	1.20*	-.035	5.75*
	(.522)	(.024)	(3.11)
R^{-2}	.069	.184	.092
N	1805	1834	1734

NOTE: Equations also include determinants of hiring policies for previous tables as independent variables here.

other methods have consistent, significant effects on the demographic outcomes.

Taken together, the results of Tables 4 and 5 indicate that recruitment methods may create some tradeoff between productive efficiency and demographic equity. Specifically, recruitment through current employees produces individuals who have higher perceived productivity and lower turnover. But these employees are less likely to be members of groups who are generally regarded as being disadvantaged - i.e., the young, females, and inexperienced workers. Of course, age and experience show some direct relationship to our measures of performance in Table 4. In fact, they appear to be a primary channel through which recruitment methods affect our performance measures. However, no such effect appears to hold for employee sex.

This last finding, combined with inferences about disadvantages for blacks using informal methods of search from previous work (Holzer, 1986), suggest that a cost-effective technique by which employers often choose their more productive employees can have unintended negative effects for certain demographic groups. The evidence here on women suggests that the negative effects are strictly a consequence of their weak "connections" with or references from those currently holding many jobs , rather than their own lower productivity. Since employers do not take this disadvantage into account when making their decisions, fewer qualified women are hired. Furthermore, there may not be any reason for these effects to diminish as time goes on unless the contacts available to these groups improve because of generally rising employment status for them. Thus

discriminatory wage and employment differentials which arose in the past might now persist on the basis of sensible hiring policies from the firm's point of view.

If true, this finding raises important questions for policymakers concerned with equity across demographic groups. While there is little sense in restricting the hiring choices of firms which appear to generate positive outcomes, the mandatory use of techniques which are more successful in recruiting qualified minorities and women may be appropriate. Of course, such practices are standard parts of many current Equal Employment Opportunity programs. Furthermore, the BNA reports suggest that community agencies and advertising are the recruitment techniques which managers perceive to be most successful for hiring minorities and women respectively.

Before concluding, we briefly consider the estimates of Equations 5) and 6) for two more outcomes: vacancy duration and hours spent recruiting and screening. These outcomes are useful as measures of the costs to employers of using various recruitment methods, since vacancy duration captures foregone profits and time spent by personnel officials represents direct costs to the firm.

Two measures of vacancy duration are considered here: total duration and duration of time "needed" (defined as total duration minus planned duration - i.e., the time before the new employee was "needed" for work). Table 6 presents estimates of recruiting and screening methods on these outcomes. These equations also include the determinants of these hiring procedures as controls.

The results show that use of current employees and direct walk-ins significantly lower the duration of vacancy and time

Table 6

Equations for Duration
Vacancy and Time Spent Recruiting/Screening

	Duration of Vacancy: Total	Duration of Vacancy: Time "Needed"	Hours Spent Rec./Screening
Recruitment:			
Current Employee	-8.88*	-5.71*	-4.67*
	(2.26)	(2.00	(1.89)
Employment Service	-2.70	-3.94	-1.26
	(4.24)	(3.78)	(3.52)
Newspaper Ad	-5.69*	-6.18*	5.25*
	(2.85)	(2.54)	(2.38)
Walk-In	-8.35*	-5.85*	-5.17*
	(2.37)	(2.10)	(1.97)
Employer Fr./Rel.	2.07	-1.81	-1.84
	(3.28)	(2.91)	(2.72)
Other Employer	-.256	-1.33	-1.87
	(3.53)	(3.15)	(2.96)
Screening:			
Probation Period	1.49	.768	1.43
	(1.66)	(1.47)	(1.38)
Physical	-.122	.029	1.93
	(2.40)	(2.13)	(2.00)
Interview	9.17*	4.59*	6.81*
	(2.86)	(2.53)	(2.38)
Reference	3.53*	3.20*	3.00*
	(1.63)	(1.44)	(1.35)
R^{-2}	.085	.042	.172
N	1877	1842	1894

NOTE: Equations also include determinants of hiring policies from previous tables as independent variables here. Durations and hours measured in hundreds.

spent recruiting. These estimates thus confirm our belief that these methods have the lowest cost in terms of direct resources or foregone profits. They also make the heavy use of current employees appear to be even more cost-effective than was previously thought. Newspaper ads also lower duration but raise time spent on recruiting and screening, thereby lowering one cost but raising another.

As for screening effects, it appears that interviews and reference checking raise durations and time spent recruiting and screening. Probationary periods also have positive effects, though these may be due to correlation with unobserved variables rather than direct causation. Thus, the time-intensive nature of many of the screening methods used by firms becomes apparent here. The general lack of observed returns to their use in Table 4 becomes an even greater mystery in light of these findings.

IV. Conclusion

In this paper I have investigated the economic determinants and outcomes of hiring procedures used by firms. The need for such an investigation was made apparent by a review of the literature in both labor economics and personnel/human resources. The former contained an older tradition of institutional writings on these issues which had never been modelled and analyzed very thoroughly in recent years. However, the search models recently formulated did provide a framework within which an analysis of specific procedures could take place. The personnel literature contained

in-depth analyses of many such procedures and issues surrounding their use. However, these analyses often lacked a framework that went beyond the perspective of the employer to capture features of the labor market which are relevant.

An attempt was therefore made to outline an employer search model in which firms choose specific recruiting and screening procedures in order to maximize profits. Each procedure involved costs and benefits which varied across jobs and firms. Once chose, these procedures would help to determine "efficiency" outcomes for the firm, such as employee productivity; as well as "equity" outcomes, such as the demographic mix of employees hired.

The empirical analysis of the paper then presented evidence on the use of these procedures and on their effects on outcomes. The results showed that the most frequently used recruiting procedure was announcing vacancies to current employees. The use of other recruiting and screening procedures was shown to be partly determined by observable characteristics of the firm and job such as industry, size, education level needed for the job, and wages offered.

As for effects on outcomes, the use of current employees to recruit produced workers who had higher perceived productivity as lower turnover than did the use of other methods. However, the workers so generated were also older, more experienced, and more likely to be male. At least the last of these effects had no observable relationship to outcomes and therefore appears to be an equity cost of using these methods. Results for the use of different screening methods were less clear. Finally, equations for vacancy

duration and time spent hiring showed the use of current employees and direct walk-ins to be the least costly to the firm in terms of foregone earnings or direct costs, while the various screening methods generally appeared to be more costly.

It should be stressed that these results are a fairly general nature. They do not provide refined measures of the use of various procedures, especially screening methods. Certain statistical flaws were also not totally eliminated here. It is hoped that these results will stimulate more research by both economists and labor relations specialists on a topic of considerable importance.

FOOTNOTES

[1] For a discussion of how labor relations has evolved out of labor economics see Dunlop (1977).

[2] The relevant Department of Labor reports are Public Employment Service and Help-Wanted Ads (1978); also Recruitment, Job Search, and the United States Employment Service (1976). The Bureau of National Affairs reports results of its Personnel Policies Forum in "Selection Procedures and Personnel Records" (1976); and "Recruitment Policies and Practices" (1979).

[3] The designation of the young as a disadvantaged group that has difficulty obtaining employment in the "Primary Sector" appears in Osterman (1980).

[4] For a review and critique of the empirical evidence on dual labor markets see Cain (1976). For a more recent attempt see Dickens and Lang (1985).

[5] For a review of the early literature on employee search see Lippman and McCall (1976).

[6] For employer search models which seek to explain total time spent recruiting and screening as well as time per applicant see Barron, Bishop and Dunkelberg (1985).

[7] In Barron, Bishop and Hollenbeck (1983) we find analyses of how specific recruitment procedures affect applicant flows to the firm as well as firm profits.

[8] For critiques of neoclassical discrimination theory see Marshall (1976) and Cain, op.cit.

[9] In Spence's model, individuals respond to how firms interpret signals in a way which may tend to verify those signals. For instance, blacks may underinvest in human capital because of the low returns they face and thereby validate the original belief.

This avoids the learning problem of Arrow's model.

[10] In Lazear's models, the deviation of wages from market-clearing levels arises from worker incentives to shirk and the employer's construction of an upward-sloping wage profile that induces the worker to supply effort until retirement time.

[11] For a recent survey of implicit contract and efficiency wage models see Stiglitz (1985).

[12] The need for employers to validate selection procedures in cases of possible racial discrimination was established by the Supreme Court in its ruling on the case of Griggs v. Duke Power in 1971.

[13] The exogeneity of wages and training in the short-run can be justified by thinking of them as being embodied in contracts or bureaucratic practices that are not easily changed. For firms which are either unionized or "wage-takers" in competitive labor markets, the assumption of exogenous wages can be sensible as well. However, alternative (and more complicated) models can be developed in which wages and training are chosen simultaneously with hiring procedures.

[14] A different category of equity concerns obviously involves the distribution of economic rewards between the firm (stockholders) and its workers. This set of outcomes should reflect various market forces as well as bargaining power within the firm. However, hiring procedures should not have any direct effect on this issue.

[15] The decision to go with the 1982 followup as opposed to the original survey was based on the broader range of recruitment variables that can be found in the former.

[16] The theoretical model above predicts that the expected

distribution of productivities facing a firm will affect its choices; i.e., expected outcomes rather than actual outcomes help determine firm choices. Thus the choices can enter the equations for actual outcomes without having to worry about their endogeneity. Controls for expected outcomes can be found in variables such as size, union status, wages, etc., which partly determine the pool of individuals applying to the firm.

A few other econometric issues must be noted here briefly. One problem with the outcome equations involves self-selection - i.e., the tendency of firms to choose hiring policies precisely because they are trying to maximize the dependent variables. This implies that the policy variables are not chosen randomly and estimates of their effects are biased. Though more formal methods are available for dealing with this problem (see Willis and Rosen, 1979), we use the determinants of the hiring procedures from Equations 2) as additional controls in the outcome equations to deal informally with this problem.

A related problem involves sample-selection - i.e., the omission from the sample of those not hired. This could cause biased estimates of the effects of age, experience, or sex on the outcomes of Equations 3). Unfortunately, without data on the characteristics of those omitted little can be done here. The results below must be interpreted with this limitation in mind.

[17] The exact wage variable used here is one for a "typical employee in this position with two years experience." Such a variable seemed less endogenous with respect to hiring policies than would a variable for the wage of the individual in

consideration. However, estimation involving different wage measures produced few differences in outcomes. Also, the training variable used here involved total hours of formal training over the first three months for the newly hired person. Again, other training variables produced similar outcomes to those listed here.

[18]A long literature in labor economics suggests that productivity may rise and turnover fall with age or experience due to greater investments by older workers in firm-specific human capital. Well-known examples of this literature include Mincer (1974).

[19]The finding that newspapers are effective for recruiting women is consistent with findings that appear in the BNA Report (1979).

REFERENCES

Aigner, D. and G. Cain. "Statistical Theory of Dscrimination in Labor Markets." Industrial and Labor Relations Review. Vol. 30, 1977.

Arrow, Kenneth. "The Theory of Discrimination." in O. Ashenfelter and A. Rees eds. Discrimination in Labor Markets, 1974.

Axell, B. and J. Albrecht. "An Equilibrium Model of Search Unemp-

loyment," Journal of Political Economy, Vol. 92, 1984.

Barron, J., Bishop, J., and W. Dunkelberg. "Employer Search." Review of Economics and Statistics, Vol. 67, 1985.

_____ , _____ , and K. Hollenbeck. "Recruiting Workers: How Recruitment Policies Affect the Flow of Applicants and Quality of New Workers. Unpublished, 1983.

Becker, G. The Economics of Discrimination, University of Chicago Press, 1971.

Breaugh, J. "Relationships between Recruiting Sources and Employee Performance, Absenteeism, and Work Attitudes." Academy of Management Journal,Vol. 24, No. 1, 1981.

Boudreau, J. and S. Rynes. "Role of Recruitment in Staffing Utility Analysis."Journal of Applied Psychology. Vol. 70, No. 2, 1985.

Bureau of National Affairs, Inc. "Selection Procedures and Personnel Records." Personnel Policy Forum Survey No. 114, September 1986.

_____ . "Recruiting Policies and Practices." Personnel Policy Forum Survey No. 126, July 1979.

Cain, G. "The Challenge of Segmented Labor Market Theories to Orthodox Theory: A Survey," Journal of Economic Literature, Vol. 14, 1976.

Datcher, L. "The Impact of Informal Networks on Quit Behavior." Review of Economics and Statistics, Vol. 65, 1983.

Dickens, W. and K. Lang. "A Test of Dual Labor Market Theory." American Economic Review, Vol. 75, 1985.

Doeringer, P. and M. Piore. Internal Labor Markets and Manpower Analysis. D.C. Heath, 1971.

Globerson, A. "Probationary Employment - Objectives and Effectiveness." Tel-Aviv University, January 1968.

Hill, R. "New Look At Employee Referrals." Personnel Journal. Vol. 49, 1970.

Holzer, H.J. "Informal Job Search and Black Youth Unemployment." National Bureau of Economic Research Working Paper No. 1860, March 1986.

Hunter, J. and F.Schmidt. "Ability Tests: Economic Benefits versus the Issue of Fairness." Industrial Relations, Vol.21, 1982.

Karren, R. "The Selection Interview: A Review of the Literature." United States Office of Personnel Management, August 1980.

Kerr, C. "The Balkanization of Labor Markets." In E. Bakke ed. Labor Mobility and Economic Opportunity. MIT Press, 1954.

Lazear, E. "Why is There Mandatory Overtime?" Journal of Political Economy. Vol. 87, 1979.

Lilienthal, R. "The Use of Reference Checks for Selection." United States Office of Personnel Management, May 1980.

Lippman, S. and J. McCall. "The Economics of Job Search: A Survey." Economic Inquiry. Vol. 14, 1976.

Malm, F. "Recruiting Patterns and the Functioning of Labor Markets." Industrial and Labor Relations Review. Vol. 7, 1954.

_____. "Hiring Procedures and Selection Standards in the San Francisco Bay Area." Industrial and Labor Relations Review. Vol. 8, 1955.

Marshall, F. R. "The Economics of Racial Discrimination: A Survey," Journal of Economic Literature, Vol. 12, 1974.

McCall, J. "Economics of Information and Job Search." Quarterly Journal of Economics, Vol. 84, 1970.

Mincer, J. Schooling, Experience, and Earnings. Columbia University Press, 1974.

Mortensen, D. "Job Search, the Duration of Unemployment, and the Phillips Curve." American Economic Review, Vol. 60, 1970.

Osterman, P. Getting Started: The Youth Labor Market. MIT Press, 1980.

Pissarides, C. "Efficient Job Rejection." Economic Journal Vol. 94, 1984.

Rees, A. "Informal Networks in Labor Markets." American Economic Review, Vol. 56, May 1966.

Reid, G. "Job Search and the Effectiveness of Job-Finding Methods." Industrial and Labor Relations Review, Vol. 25, 1972.

Reynolds, L. The Structure of Labor Markets. Harper and Row, 1951.

Schmidt, F. et. al. "Racial Differences in Validity of Employment Tests: Reality or Illusion?" Journal of Applied Psychology, Vol. 53, 1973.

Schwab, D. "Recruiting and Organizational Participation." In K. Rowland and G. Ferris, Eds. Personnel Management. Allyn and Bacon, 1982.

Spence, A. M. "Job Market Signalling." Quarterly Journal of Economics, Vol. 87, 1973.

Steffy, B. and J. Ledvinka. "The Impact of Five Definitions of Fair Employee Selection on Long Run Minority Employment and and Employee Utility." Industrial Research Center Working Paper 86-04, 1986.

Stigler, G. "Information in the Labor Market." Journal of Political Economy, Vol. 70, 1962.

Stiglitz, J. "Implicit Contracts and Efficiency Wages: A Survey," National Bureau of Economic Research Working Paper, 1985.

Taylor, M. S. and D. Schmidt. "A Process-Oriented Investigation of Recruitment Source Effectiveness." Personnel Psychology. Vol. 36, 1983.

United States Department of Labor. Recruitment, Job Search, and the United States Employment Service. R.& D. Monograph 43, Employment and Training Administration, 1976.

_____. The Public Employment Service and Help-Wanted Ads. R.& D. Monograph 59, Employment and Training Administration, 1978.

Willis, Robert and Sherwin Rosen. "Education and Self-Selection." Journal of Political Economy. Vol. 87, 1979.