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THE EFFECTS OF UNIONS ON HUMAN CAPITAL INVESTMENTS AND RETURNS

Ву

CHERYL LYNN MARANTO

## A DISSERTATION

## Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

## DOCTOR OF PHILOSOPHY

College of Social Science

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#### ABSTRACT

# THE EFFECTS OF UNIONS ON HUMAN CAPITAL INVESTMENTS AND RETURNS

Ву

Cheryl Lynn Maranto

Most previous research has predicted and found that unions reduce employees' returns to all human capital, but has used proxies for total work experience. Two prior studies have used direct measures of previous work experience and tenure with the present employer. These latter studies have found that unions reduce employee returns to previous experience, but do not significantly alter returns to current employer tenure.

This study attempts to refine this literature, both theoretically and empirically. The institutional channels of union influence on employee returns to human capital are examined, and total tenure is decomposed into time in the entry-level job, on-the-job training received in the current job, and time on the current job after receipt of OJT. Union influence on job evaluation and the strength of seniority in promotion contract provisions are expected to create institutional constraints on wage-setting and labor allocation within firms. Employers are expected to respond to these constraints in ways predicted by price theory. This study departs from prior work by hypothesizing that collective bargaining coverage will increase returns to time on the job received through promotion.

Hypotheses concerning average union/nonunion differences in returns to human capital, and the effects of the strength of seniority in promotion provisions within the union sector were tested by regression analysis. An index measuring the strength of seniority provisions (SENINDEX) was constructed for the latter analysis in order to test this channel of union influence.

Full age samples of men and women by race were used in the regressions. These micro data were obtained from the 1976 Panel Study of Income Dynamics. The SENINDEX was constructed from the Bureau of Labor Statistics' file of major contract provisions in 1968 and 1969.

The results for white men strongly supported the hypotheses that unions reduce returns to education, tenure in the entry-level job, and OJT, but increase returns to tenure in the job received through promotion. The results for nonwhite men supported the proposition that seniority rules are the channel through which unions reduce returns to previous work experience. DEDICATION

In Memory of

Marilyn Shevitz

and

Theistic Ecumenical Communism

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#### CHAPTER I

#### INTRODUCTION

The purposes of this dissertation are first, to examine the channels through which unions influence wages within internal labor markets, and then, to subject these newly formulated hypotheses to empirical tests. Human capital and internal labor market theories, in conjunction with the institutional literature on unionism and collective bargaining, form the basic framework of the analysis. Hypotheses are generated from knowledge of union goals, as articulated in collective bargaining agreements, and from management responses which are predicted by price theory. These hypotheses focus on the effects of collective bargaining coverage on the acquisition of and returns to human capital investments of bargaining unit employees.

According to human capital theory, the types and amounts of training possessed by individuals determines their labor productivity. Because wages are determined by productivity, training increases the present value of the expected earnings stream over an individual's working life. The expectation of future earnings gains causes people to add to their stock of human capital through formal education and, once they enter the labor force, through experience on the job.

Human capital theorists make an analytical distinction between general and specific human capital. General human capital is equally productive over a wide spectrum of labor market activities and, thus, is transferable between employers; purely specific human capital is productive only in the firm in which the training is acquired. Changing employers results in the loss of specific human capital for productive purposes, but not in the loss of general human capital.

The distinction between general and specific human capital is paralleled by the distinction between external and internal labor markets found in the institutional labor economics literature. The external market consists of all job seekers within the relevant geographic area. Economic variables directly control the pricing and allocation of labor within the external labor market. The internal labor market has been defined as a firm or plant "within which the pricing and allocation of labor is governed by a set of administrative rules and procedures."<sup>1</sup> The external and internal labor markets are connected by entry ports, the job classifications to which new hires are typically assigned. Most entry ports lie at the bottom of a promotional sequence

<sup>&</sup>lt;sup>1</sup> Peter B. Doeringer and Michael J. Piore, <u>Internal Labor</u> <u>Markets and Manpower Analysis</u>, (Lexington, Mass.: D. C. Heath, 1971), pp. 1-2. The concept of an internal labor market was first formulated by John T. Dunlop in "Job Vacancy Measures and Economic Analysis," <u>The Measurement</u> <u>and Interpretation of Job Vacancies</u>: <u>A Conference Report</u>, National Bureau of Economic Research (New York: Columbia University Press, 1966).

or job ladder. As employees become familiar with the production techniques and equipment of the firm, they acquire the knowledge required to perform jobs higher up in the promotional sequence, <u>i.e.</u>, they invest in specific skills learned on the job. The competition for most jobs above the entry ports is restricted to workers already employed by the firm, because these employees have gained the knowledge required to fill these jobs at the least cost to the employer. Thus, one function of internal labor markets is to train an adequate supply of qualified workers for more advanced jobs within the same firm as vacancies are created by labor turnover.

Internal labor markets are delimited from the external labor market by administrative rules governing promotions and layoffs. Through collective bargaining, unions further reduce the direct impact of economic forces on internal labor markets in a number of ways: (1)By codifying administrative rules in written collective bargaining agreements, unions make these rules less subject to change. (2)By increasing the weight accorded to seniority for promotion decisions, unions restrict the number of job openings coming to the external labor market and contribute to more automatic progression to higher rated jobs based on length of service. Similarly, by negotiating inverse seniority rules for layoffs, unions substantially increase the job security of senior workers. (3)By obtaining

grievance and arbitration provisions in almost all contracts, unions provide workers with an alternative to quitting. Termed "voice" by the relevant literature, union sector workers can express discontent with management rules and decisions during the term of the contract.<sup>2</sup> (4)By periodically renegotiating basic terms and conditions of employment, unions have the opportunity to bargain for more fundamental changes in these terms and conditions.

These union-induced changes, as well as increased wages, are believed to decrease labor turnover, specifically worker-initiated quits.<sup>3</sup> Because employers' willingness to provide firm-specific training to individuals depends on the expected length of employment, unionization should encourage and protect investments in firm-specific human capital.

A new and growing literature in labor economics has attempted to ascertain union effects on the returns employees receive from their investments in human capital. Most of these studies<sup>4</sup> have examined union effects on

<sup>&</sup>lt;sup>2</sup> See, for example, Richard B. Freeman, "Individual Mobility and Union Voice in the Labor Market," <u>American Economic</u> Review, vol. 66, no. 2 (May 1976): 361-368.

<sup>&</sup>lt;sup>3</sup> Empirical evidence supporting this hypothesis is provided in Richard B. Freeman, "The Effect of Unionism on Worker Attachment to Firms," <u>Journal of Labor Research</u>, vol. 1, no.1 (Spring 1980): 29-61.

Only three studies have disaggregated total work experience thus far. These studies are: Jeffrey Pfeffer and Jerry Ross, "Union-Nonunion Effects on Wage and Status Attainment," <u>Industrial Relations</u> 19 (Spring 1980): 140 -150; Cheryl L. Maranto, "The Effects of Unions on Returns to Human Capital Investments of Mature Women in Manufacturing Industries, 1972" (Master's thesis, Michigan

returns to education and total work experience. However, total work experience can be divided into at least two components: work experience prior to the present employer, or previous experience; and work experience with the present employer, or tenure. All of these studies have hypothesized that unions influence returns to work experience by means of seniority rules; however, these rules can be expected to affect returns to the two work experience components very differently. Missing in the literature is an examination of the possibly differential effects of unions on returns to previous experience and to tenure with the present employer. This dissertation tests the institutionally and theoretically derived hypotheses using differentiated experience variables and data obtained from a large sample of employees: the Panel Study of Income Dynamics (PSID). Direct measures of work experience replace the more commonly used proxy variables. Experience prior to the present employer and tenure with the present employer are entered separately into the estimating equation. Α further refinement of the empirical model separates current employer tenure into three segments: tenure prior to the present position, on-the-job training (OJT) received on the present job, and post-training tenure. This detailed work experience information offers substantial improvement over

State University, 1979); and Jacob Mincer, "Union Effects: Wages, Turnover and Job Training, National Bureau of Economic Research Working Paper No. 808, November, 1981.

most prior studies. It allows a test of whether seniority rules do in fact have differential effects on returns to work experience received in external and internal labor markets. A direct measure of the amount of OJT helps disentangle the complex effects unions are expected to have on the acquisition, financing, and employee returns to OJT. Union effects on all aspects of on-the-job training remain highly disputed issues economists. Several among alternative empirical models are developed and tested in order to determine whether the use of progressively detailed experience measures contributes to resolution of this controversy.

Other improvements compared with previous studies can be made using the PSID data. First, the PSID contains a full age range, from 18 to 64 years of age. The only other large micro data set with comparable information on work experience, the National Longitudinal Survey, is used in various published studies, although the NLS provides samples of limited age groups. Since estimates of previous experience and tenure coefficients are likely to be sensitive to truncation by age,<sup>5</sup> a full age sample is essential.

Second, the size of the sample allows estimation of employee returns to human capital by union status, race and sex group. A large data sample is important for several

<sup>5</sup> Mincer, "Union Effects," p. 38.

reasons. Union wage effects are not necessarily the same across demographic groups. Few previous studies of union effects on returns to human capital have investigated these effects on women's wages. It is of substantial policy, as well as theoretical interest, to determine whether unions do alter wages differently for men and women, or for whites and nonwhites. There is also an important econometric reason for separate estimation. The extensive use of binary and their interactions within variables а single equation--the primary alternative to separate estimation--might make the matrix of data on the independent variables sufficiently ill-conditioned to cause important errors of estimation.

The basic premises of this study are that wage determination, job assignment, and on-the-job training occur largely within internal labor markets, and that unions create formal, codified rules and institutions governing or affecting many aspects of labor allocation and remuneration. The focus on unions is in part a means of gaining access to the dynamics of the internal pricing and allocation of labor, in order to better study and understand these dynamics. The study of unionism per se is of equal importance, however, because unions are critical institutions which affect the operation of labor markets. The objective of this study is to provide needed insight into the channels through which unions influence the wages of all demographic groups within the private sector.

#### CHAPTER II

### LITERATURE REVIEW

The first empirical investigations into union wage effects regarded unions as an additional empirical fact. Unions were taken into account by including a single binary union variable in the equation used for estimating wages. These early studies<sup>6</sup> estimated a "lump-sum" per hour of work effect. More recently, there has been a recognition that seniority provisions are a means by which unions may alter the acquisition of post-school training and employee returns to it. The latter studies are reviewed below. Differences between these studies in the samples used for estimation, (e.g., occupational scope), quality of work experience measures, and model specification have produced results which are not comparable, and sometimes conflict.

<sup>&</sup>lt;sup>6</sup> See, for example, Paul M. Ryscavage, "Measuring Union-Nonunion Earnings Differences," <u>Monthly Labor Review</u> 97 (December 1974): 3 - 9, and Orley Ashenfelter, "Union Relative Wage Effects: New Evidence and A Survey of their Implications for Wage Inflation," <u>Report to the Council on</u> <u>Wage and Price Stability</u> (June 2, 1977).

## Union Effects on Returns to Total Work Experience and Education

Utilizing data on male blue-collar workers in the private sector, a single binary variable denoting race, and age as a proxy for total work experience, Johnson and Youmans found that union members receive significantly lower returns to both age and education than comparable nonunion workers.<sup>7</sup> The wage-age profile of union workers rose more slowly and peaked ten years later than the profile of their nonunion counterparts. The authors interpreted the flatter union sector profile to be the result of: (1) the union goal of achieving a standard rate for comparable production work, and (2) greater job security in unionized firms discouraging individual investments in on-the-job training. Johnson and Youmans did not consider the possibility of some alternative explanations. For instance, unions might induce employers to finance a greater proportion of OJT than do nonunion sector employers, thereby causing union sector employers to receive a greater share of the returns from training. Alternatively, the age proxy for work experience could be capturing an age or cohort effect unrelated to the amount of The authors postulated that union age-wage OJT received. profiles peak later due to the impact of union-negotiated seniority systems which favor older workers in promotion

<sup>&</sup>lt;sup>7</sup> George Johnson and Kenwood C. Youmans, "Union Relative Wage Effects by Age and Education," <u>Industrial</u> and <u>Labor</u> <u>Relations Review</u> 24 (January 1971): 171 - 179.

decisions.

Bloch and Kuskin used the "potential experience" proxy as a work experience measure. This proxy was calculated as age minus education minus six.<sup>8</sup> The data used for empirical estimation included only white males, in order to "circumvent complex interactions between wage rates, unionism and discrimination," but included all occupational groups. Bloch and Kuskin found wage rates to be significantly less responsive to differences in education and potential work experience in the union sector. Their results indicated only a one and one- half year difference in the time that wage-experience profiles peaked between the two sectors. The returns to total potential work experience were, however, estimated to be twice as great in the nonunion sector as compared with the union sector.

Richard Freeman analyzed the effect of unionism on wage dispersion. As a by-product, his analysis produced estimates of the effect of union membership on returns to human capital of male blue-collar workers in the private sector.<sup>9</sup> Freeman found that union members receive substantially lower returns to education and to potential experience than do workers who are not union members.

<sup>&</sup>lt;sup>8</sup> Farrel E. Bloch and Mark S. Kuskin, "Wage Determination in Union and Nonunion Sectors," <u>Industrial</u> and <u>Labor</u> Relations Review 31 (January 1978): 183 - 192.

<sup>&</sup>lt;sup>9</sup> Richard B. Freeman, "Unionism and the Dispersion of Wages," <u>Industrial</u> and <u>Labor</u> <u>Relations</u> <u>Review</u> 34 (October 1980): 3 - 24.

Lung-Fei Lee utilized data on male and female operatives in mining, construction, manufacturing, transportation, communication, utilities, and sanitary services.<sup>10</sup> Although the principal focus of his study was the possibility of selectivity bias,<sup>11</sup> the use of separate wage equations for union and nonunion sectors provided information about differing returns to education and potential experience between sectors. Lee's results indicated that returns to education of unionized workers were lower, and returns to potential experience were greater than comparable nonunion workers. In addition, the author calculated percentage union/nonunion wage differentials, adjusted for selectivity bias, of only 2.8 percent for white women, compared with 16.3 percent for white men, 28.4 percent for black men, and 12.7 percent for black women.

- <sup>10</sup> Lung-Fei Lee, "Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables," <u>International Economic Review</u> 19 (June 1978): 415 - 433.
- <sup>11</sup> Selectivity bias refers to the statistical problem which arises if the observed dependent variable (in this case, wages in union and nonunion sectors) is not a random sample drawn from the entire wage distribution. It context arises in the of union wage effects if individuals' decisions to accept union or nonunion employment are based on the differential between expected wages in their best union and nonunion alternatives. In this case, estimation by Ordinary Least Squares (OLS), will produce biased and inconsistent estimates. (The disturbance terms in the wage equations will be correlated with union status.) Although this problem is theoretically important, all attempts to correct it via more appropriate statistical techniques have resulted in coefficient estimates which are virtually identical to those obtained using Ordinary Least Squares.

The manner in which Lee specified the model indicates that his estimates of returns to experience and union wage differentials by race/sex group should be viewed with some skepticism. Although separate equations were estimated for each sector, data on men and women were combined into a single wage equation for each sector, with a single binary variable indicating sex, and no interaction terms. This empirical specification necessarily constrains women's returns to human capital to be equal to men's.

The problematic nature of Lee's specification derives from several considerations. When using the potential experience proxy, several researchers have estimated relatively flat wage-experience profiles for women as compared with men.<sup>12</sup> Oaxaca noted that flatter estimated wage-experience profiles for women could be caused in part by statistical bias created by systematic measurement error when this proxy is used to estimate women's wages. Such bias is due to average differences in life-cycle labor force participation between the sexes.<sup>13</sup> Duncan and Hoffman found that, even when using direct reports of actual years of work

<sup>&</sup>lt;sup>12</sup> See, for example, Alan S. Blinder, "Wage Discrimination: Reduced Form and Structural Estimates," <u>Journal of Human</u> <u>Resources</u> 8 (Fall 1973): 436 - 455; and Robert E. Hall, "Wages, Income and Hours of Work," in <u>Income Maintenance</u> <u>and Labor Supply</u>, Glen Cain, ed. (Chicago: Rand-McNally <u>Pub. Co., 1973)</u>: pp. 102 - 117.

<sup>&</sup>lt;sup>13</sup> Ronald Oaxaca, "Sex Discrimination in Labor Markets" in <u>Discrimination in Labor Markets</u>, Orley Ashenfelter and Alber Rees eds. (Princeton, N.J.: Princeton University Press, 1973): pp. 124 - 154.

experience, estimated returns to experience were considerably lower for women of both races than for men.<sup>14</sup> Lee's smaller coefficient estimate for the experience variable in the nonunion, rather than in the union equation, could be due to the larger proportion of women in the nonunion sector. Lee's pooling of men and women in a single equation may also account for the unusually small union wage differential estimated for white women. For example, if unions affect women's wages in part by equalizing returns to experience relative to men, constraining returns to be equal before calculating the union wage effect, would produce downward biased estimates of the union wage effect for white women.

Duncan and Leigh examined union/nonunion differences in all wage determining variables using Generalized Least Squares (GLS) to adjust for sample selectivity.<sup>15</sup> The data used for estimation were middle-aged white men from the National Longitudinal Survey. This sample was chosen in order to compare the results with Bloch and Kuskin's Ordinary Least Squares (OLS) estimates. Duncan and Leigh found that returns to education, as well as company training

<sup>&</sup>lt;sup>14</sup> Greg J. Duncan and Saul Hoffman, "On-the-Job Training and Earnings Differences by Race and Sex," <u>Review of</u> Economics and Statistics 61 (November 1979): 594 - 603.

<sup>&</sup>lt;sup>15</sup> Gregory M. Duncan and Duane E. Leigh, "Wage Determination in the Union and Nonunion Sectors: A Sample Selectivity Approach," <u>Industrial</u> and <u>Labor</u> <u>Relations</u> <u>Review</u> 34 (October 1980): 24-34.

and noncompany training,<sup>16</sup> were substantially lower for men employed in the union sector relative to their nonunion counterparts. The dummy variables for age (used as proxies for work experience) did not attain statistical significance in either union or nonunion equations, regardless of the statistical procedure used. The failure of age to attain statistical significance may be due to the limited age range The limited age range necessarily reduces the observed. variance in age which may contribute to explaining wages. A related consideration is that the use of a middle-aged sample can be expected to capture only the top of the parabolic relationship between wages and age, i.e., where the wage-age profile is flattest. In addition, Duncan and Leigh compared the GLS, or selectivity-adjusted wage equation estimates, with those obtained using OLS. The adjustment procedure produced noticeable differences only for the nonunion sector coefficient estimates. Among the human capital coefficients, company and noncompany training and the 55 - 59 age dummy changed by one or two percentage The union equation estimates were virtually points. unchanged by the selectivity bias adjustment.

<sup>&</sup>lt;sup>16</sup> Company training refers to participation in a company-sponsored training program of six weeks or more. Non-company training refers to completion of training offered by a business college or technical institute, vocational training received in the armed forces, and vocational training other than OJT.

In a related study examining racial differences in union wage effects, Leigh applied the selectivity bias adjustment to the samples of young and middle-aged men from the National Longitudinal Survey.<sup>17</sup> For the middle-aged cohort, union membership was found to depress returns to education, as well as to company and noncompany training, for both white and black men. Age had a statistically significant effect only for nonunion blacks aged 55-59; this effect was negative. The results differed for young blacks. Specifically, returns to education were identical in union and nonunion sectors, and the age-earnings profile was steeper for unionized young blacks than for their nonunion The estimated union/nonunion counterparts. wage differentials were substantially greater for middle-aged blacks than for whites. For the younger cohort, in contrast, white men obtained a greater union wage differential than did black men. Finally, contrary to earlier work which used systems of equations to estimate union relative wage effects, both the Duncan and Leigh study and the Leigh study reported that use of the selectivity adjustment increases the size of the estimated bias union/nonunion wage differential.

<sup>&</sup>lt;sup>17</sup> Duane E. Leigh, "Racial Differentials in Union Relative Wage Effects: A Simultaneous Equations Approach," <u>Journal</u> of Labor Research 1 (Spring 1980): 95 - 114.

All of the studies discussed above use aggregate experience measures. These measures do not distinguish between experience acquired with the present employer and all previous work experience. With the exception of Lee's work, all reported findings are consistent with the hypothesis that collective bargaining coverage will reduce returns to education and to total work experience. As a result of using aggregate experience measures, all of the foregoing studies leave unanswered the questions of whether union coverage has differential effects on the two experience components, or differential effects on the various tenure segments. These questions are formulated in the hypotheses to be tested in this dissertation.

#### Union Effects on Returns to Tenure with Present Employer and Education

Pfeffer and Ross, using data on men 45 to 59 years old employed in all industries and occupations, and including a single binary variable denoting race, found that returns to tenure with the present employer, as well as returns to education, were significantly lower for those individuals whose wages were set by a collective bargaining agreement.<sup>18</sup> A measure of previous work experience was not included among the independent variables. In general, the omission of an important independent variable which is correlated with both the dependent variable (in this case, wages) and one or more

18 Pfeffer and Ross, "Union-Nonunion Effects."

independent variables (most importantly, tenure) will result in biased and inconsistent estimators. That is, the expected value of the error term will not be zero; it will be correlated with the omitted tenure variable. Since both the sign and the size of the simple correlations between tenure and previous experience<sup>19</sup> differ across race/sex groups and between union and nonunion sectors, the direction of the bias of the tenure coefficient cannot be determined.

Pfeffer and Ross, among others, use an unrestricted occupational sample which may be problematic when estimating union wage effects. For example, professional-technical and managerial workers are virtually all unorganized, but may receive more OJT, and hence, greater returns to tenure with the present employer than less skilled workers. Therefore, it is difficult to assess whether the different estimates of returns to tenure between the union and the nonunion sectors are due to unionization per se, or whether they are due to negative correlation between the strong occupations requiring substantial amounts of formal education and union status. In other words, the smaller coefficient of tenure in the union equation may be due in part to the absence of professional-technical workers and managers among unionized workers.

<sup>&</sup>lt;sup>19</sup> The simple correlations referred to above were calculated using the PSID data.

In an earlier study which disaggregated the observed total experience measure, restricted estimation to manufacturing industries, and utilized data on women aged 40 Maranto found that returns to previous work to 49, experience, as well as to education were lower, and returns to tenure with the present employer were greater for women who were covered by a collective bargaining agreement than for nonunion sector women.<sup>20</sup> None of these differences were statistically significant. The failure to find significant differences in returns to the work experience measures between union and nonunion sectors may be due to the highly restricted age range of the sample used for estimation, since the use of limited age groups reduces the amount of variation in the experience measures with which to explain wages. Additionally, the amount of on-the-job training received, access to jobs with significant progressions, and any sex differences in access to jobs could not be determined with the data used. This study also used an unrestricted occupational sample. However, only four the in the sample percent of women were professional-technical or managerial workers.

Mincer examined union effects on returns to two experience components for white men in all occupations and industries. Cross- sectional and time-series data for ten

<sup>&</sup>lt;sup>2</sup> Maranto, "The Effect of Unions on Returns to Human Capital Investments of Mature Women"

years were pooled.<sup>21</sup> He reported that union members received lower returns to education and experience, although it is not clear how he measured experience. In Mincer's wage level equations, the tenure coefficient was slightly, but not significantly, greater for unionized men, compared with men who were not union members. The wage growth equations produced identical tenure coefficients in union and nonunion sectors.<sup>22</sup>

#### Summary of Studies

Table 2-1 below summarizes the samples, experience measures, definition of the union variable,<sup>23</sup> and findings of union effects on returns to human capital.

Examination of this table indicates that there are substantial differences in findings across studies, particularly with respect to union effects on returns to work experience. Therefore, only tentative conclusions can be drawn from the literature review and Table 2-1. Unions reduce returns to pure skill measures (education and postschool training) for white men, and to post-school training for nonwhite men as well. Finding no union-induced reduction in returns to education for young blacks, and being the only study to separately examine union effects on

<sup>21</sup> Mincer, "Union Effects."

- <sup>22</sup> There were no occupational controls in these estimating equations.
- <sup>23</sup> The issue of the appropriate definition of unionism will be discussed in the following chapters.

Findings From Studies Examining Union Effects on Returns to Human Capital DATA EXPER<sup>1</sup> UNION ED<sup>2</sup> TOT<sup>3</sup> PREV<sup>4</sup> TEN<sup>5</sup> TRG<sup>6</sup> Johnson male age member-& blueship Youmans collar, W & NW<sup>7</sup> comb. Bloch white proxy<sup>8</sup> member-& men, ship Kuskin all occs. Freeman male proxy<sup>8</sup> memberblueship collar, W & NW<sup>7</sup> comb. Lee men & proxy<sup>8</sup> member-+ women ship  $W \& NW^7$ comb. operatives Duncan mid-age age member-0 -women, & ship Leigh all occs. Leigh men memberage  $W \& NW^7$ ship sep., all occs. young black 0 + young white 0 \_ mid-age black 0 mid-age white 0

## Table 2-1
Table	2-1	(cont'	d.)
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	DATA	EXPER <sup>1</sup>	UNION	ED <sup>2</sup>	TOT <sup>3</sup>	PREV <sup>4</sup>	TEN⁵	TRG <sup>6</sup>
Pfeffer & Ross	mid-age men, W & NW <sup>7</sup> comb., all occs.	tenure	coll. barg. cover.	-		none	-	
Maranto	mid- age women, W & NW <sup>7</sup> comb., all occs.	prev. & tenure	coll. barg. cover.	-		0	0	
Mincer	W men all occs.	exper. <sup>9</sup> & tenure	member- ship	-		-	0	

<sup>3</sup>TOT: Total years of work experience.

<sup>4</sup>PREV: Years of work experience prior to the current employer.

<sup>5</sup>TEN: Years worked for the current employer.

<sup>6</sup>TRG: Months of company or non-company training.

<sup>7</sup>W & NW comb.: Refers to the empirical specification in which white and nonwhite individuals are pooled in one equation, with a single variable denoting race.

<sup>8</sup>proxy: Refers to use of the total work experience proxy, calculated as (age - education - 6).

<sup>9</sup>It is unclear how the "experience" variable is measured.

returns to human capital for whites and blacks, Leigh's study does not provide sufficient evidence to conclude that there is a race difference in union effects on returns to education.

Estimated coefficients of the total experience proxies suggest that unions depress these returns for white men. It clear, however, how these results should is not be interpreted. For example, the total experience proxies might primarily capture the effects of age itself (including cohort effect), or the effects of previous work а experience, or the effects of general human capital regardless of where it was acquired. Alternatively, the proxies may capture a mixture of union effects on employee returns to previous experience and on their returns to tenure with the present employer, although these union effects are expected to differ. Indeed, to the extent union quit reductions increase tenure with the current employer, collective bargaining coverage should change the composition of total work experience, increasing the proportion of total experience which is accounted for by current employer tenure. Thus, the use of total work experience in empirical studies will certainly capture both union effects on the composition of total experience and union effects on returns each experience component. The two studies which to decompose total experience and include both experience measures (Mincer and Maranto) suggest that unions

differentially affect returns to the two experience components. However, since neither study finds statistically significant differences in returns to tenure across union and nonunion sectors, the most that can be concluded is that unions do not alter returns to tenure for union sector workers relative to their nonunion counterparts. This conclusion is still contrary to the hypothesis that unions will depress returns to all human capital, which appears in all of the other studies.

With respect to differences in union effects across demographic groups, the study by Leigh, which estimates separate equations by race as well as union status, suggests that union effects on returns to age and education may differ between young white and nonwhite men. However, no conclusion can be drawn whether union effects on returns to human capital differ by race or sex, since only one study has produced separate estimates for each.

#### CHAPTER III

# THE ROLE OF UNIONS IN THE ACQUISITION AND FINANCING OF HUMAN CAPITAL INVESTMENTS WITHIN INTERNAL LABOR MARKETS

The literature on union wage effects now recognizes that collective bargaining changes the wage structure as well as the wage level. One way that unions are believed to alter the wage structure is through contractual seniority provisions. However, unions have heretofore been treated essentially as an external force. The particular channels through which seniority rules alter labor allocation and pricing within the firm have not been conceptualized to provide an adequate foundation on which a theory of unionism can be built. This chapter contains an analysis of union influence on the specificity of human capital which bargaining unit members receive, and on the financing of human capital investments by employers and employees. The hypotheses which emerge from this analysis, and are subsequently tested, may contribute to the development of a theory of union effects. Because unions are viewed here as exerting their influence primarily within particular firms or plants, internal labor market theory constitutes an important basis of the analysis.

Several aspects of unionization impose institutional constraints on the wage determination process within firms. increases are expected to induce Union-won wage price-theoretic responses<sup>24</sup> by employers who attempt to abate the differential between the wage rate and the opportunity marginal product over time. Employer responses to union wage gains are channeled in predictable ways as a result of the institutional constraints unions create. Examination of the "challenge and response" dynamic between union and management allows the identification of the channels of union influence on the acquisition of, and returns to, human capital of bargaining unit members within internal labor markets. The unit of analysis for the examination of union effects will be the internal labor market for two reasons. First, unions are expected to reinforce the process by which internal labor markets are Second, the locus of union institutions and generated. power in the United States is at the plant level.

There are three principal forces which create internal labor markets: skill specificity, on-the-job training, and the development of "customary law."<sup>25</sup> According to internal labor market theory, as the skills required for efficient

<sup>&</sup>lt;sup>24</sup> Responses of employers to differences in wages and prices are now often described as "price-theoretic" responses.

<sup>&</sup>lt;sup>25</sup> Customary law means that, once rules are established to govern wage and employment opportunities in a plant, workforce expectations and definitions of equitability are built around them; these rules then become resistant to change.

performance of a job become increasingly specific, training job becomes the most economical method on the of transmitting this knowledge.<sup>26</sup> Skill specificity increases the proportion of training costs financed by the employer, the magnitude of these costs, and the costs of termination and recruitment. All of these consequences of skill specificity increase the incentive for employers to reduce labor turnover. Because the skills acquired on the job are applicable only within the context in which they are obtained, formal training is progressively precluded as an alternative method of skill transmission. Increased skill specificity promotes a permanent employment relationship. This, in turn, shifts employer concern away from the equality of the wage and the value of marginal product at a single point in time, toward the equality of the wage and the value of marginal product over the period of expected tenure. Employment and wage decisions within internal labor markets apply to groups of workers, hence the development of job, as opposed to individual, wage rates.<sup>27</sup> These dynamics

<sup>26</sup> Doeringer and Piore, Internal Labor Markets, pp. 13-35.

<sup>27</sup> It is interesting to note that most of the implications which flow from internal labor market theory are fully consistent with human capital theory. The principal divergence lies in the different levels of abstraction, and thus the importance, each theory assigns to institutional structures. Human capital theory focuses on the individual as the unit of analysis, abstracting from the influence of job structures and written policies governing personnel decisions. Internal labor market theory gives these institutional features considerable explanatory significance. The institutional focus of internal labor market theory makes it particularly useful of internal labor market development are believed to occur irrespective of unionization. However, collective bargaining coverage is expected to intercede at critical points in the development of internal labor markets, further reinforcing these dynamics, as will be discussed below.

An internal labor market is defined as "an administrative unit, such as a manufacturing plant, within which the pricing and allocation of labor is governed by a set of administrative rules and procedures."28 The rules and procedures which define the boundaries of an internal labor market set relatively fixed standards for internal mobility and pay of the current workforce. Entry criteria, on the other hand, must be more responsive to conditions such as unemployment, wages paid by competitors, etc., which exist in the external labor market. The rules governing the internal labor market tend to be inflexible because workforce expectations, and treatment which is regarded as just (i.e., "customary law"), are based on these rules. Additionally, the codification of administrative rules in collective bargaining agreements reduces the susceptibility of these rules to change. The rigidity of these rules insulates the internal labor market from external economic Thus, at the most fundamental level, unionism forces. reinforces the insular nature of the internal labor market

in an analysis of union wage effects.

<sup>28</sup> Doeringer and Piore, <u>Internal Labor Markets</u>, pp. 1 - 2.

by codifying the rules governing promotion, transfer, layoff, and recall in seniority provisions.

The second reason for focusing on internal labor markets derives from the goals of this study, as well as the basic nature of the industrial relations system in the United States. The intention of this work is to scrutinize the channels through which unions produce their well-documented net effect, increased wages. Collective bargaining, and hence, the locus of power within the labor movement in this country, is fundamentally plant-based. Therefore, unionism should exert its influence on wages primarily at the plant level. The expectation that union effects on employee returns to human capital are most fruitfully studied within the context of internal labor markets derives from the plant-based structure of American unionism.<sup>29</sup>

The first section of this chapter examines the development of union rules which have direct and indirect effects on wage- setting practices, and the goals motivating their adoption. The second section of this chapter examines anticipated price-theoretic responses of unionized employers to negotiated wage increases within the context of these union rules. These discussions form the basis for the

<sup>&</sup>lt;sup>29</sup> It should be noted that plant-based unionism which is independent of particular employers is a uniquely North American phenomenon. Thus, this unit of analysis and the findings of this study are not necessarily applicable to other countries.

specific theoretical predictions and model specifications presented in Chapter IV.

# Union Rules Affecting Wage Setting Practices

Unions have established a "web of rules"<sup>30</sup> to govern a wide range of personnel decisions in firms. These rules restrict managerial discretion in wage setting and labor allocation. In very general terms, the union goal is to substitute standardized and codified decision rules based on objective criteria in the place of supervisory judgments regarding ability and performance. These rules reflect the central union concerns of promoting equitable treatment among workers, minimizing competition among members, and enhancing administrative convenience. These union goals are achieved by means of job evaluation, seniority systems, and grievance and arbitration contract provisions. The net effect of these rules is to standardize wages within a firm or plant, i.e., within an internal labor market.<sup>31</sup>

<sup>&</sup>lt;sup>30</sup> This phrase was first used to describe unions' institutional effects by Sidney Webb and Beatrice Webb, <u>Industrial Democracy</u>, (New York: Longmans, Green and Co., 1897), and has been used more recently by Sumner H. Slichter, James J. Healy and E. Robert Livernash, <u>The</u> <u>Impact of Collective Bargaining on Management</u> (Washington D.C.: The Brookings Institution, 1960).

<sup>&</sup>lt;sup>31</sup> These union effects within a firm or plant are consistent with, but distinguished from, the union "standard rate" policy. "Standard rate" policy attempts to reduce wage differences across firms within an industry or local product market in order to "take wages out of competition," thus preserving the competitiveness of unionized firms in the relevant product market. See Webb and Webb, <u>Industrial</u> <u>Democracy</u>, for the seminal

### Job Evaluation

In general, "job evaluation may be defined as an attempt to determine and compare the demands that the normal performance of particular jobs make on normal workers without taking account of individual abilities or performance of the workers concerned."32 Developing a job evaluation plan entails selecting the factors (e.g., working conditions, level of responsibility, skill, and minimum educational requirements) which determine the demands that a job makes on workers. A maximum number of points are attached, or a weight is accorded to each factor. Criteria are developed to determine the portion of the maximum points for each factor which should be assigned to a given job; the points are totalled; then jobs are assigned to labor grades defined by a range of job evaluation points.<sup>33</sup> The objective of job evaluation is to investigate and compare job content, regardless of the individuals who perform the jobs.

Although job evaluation is used primarily for the purpose of compensation administration within firms, pricing the job structure defined through the job evaluation process is not, strictly speaking, a part of job evaluation. Job evaluation measures the levels of skill and responsibility of each job, and the relationship between jobs using these

discussion of union "standard rate" policy.

- <sup>32</sup> David W. Belcher, <u>Compensation Administration</u> (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974), p. 89.
- <sup>33</sup> Doeringer and Piore, Internal Labor Markets, pp. 66-68

The pricing of jobs, as well as the setting of measures. individual wage rates, are distinguishable processes. The pricing of job structures is constrained to reflect some difference between jobs assigned different evaluation points. The pricing of jobs is also constrained by the external labor market in that key jobs, i.e., jobs which are very similar throughout the local labor market, must pay competitive wages. However, given these constraints, individual firms possess considerable latitude in establishing the precise wage differentials between differently evaluated jobs. Also, the conceptual distinction between the evaluation of job content and individual performance permits separate appraisal of the performance of individuals on the same job.<sup>34</sup> Therefore, there is nothing inherent in job evaluation per se which affects internal wage structure.

The primary effect of unionism upon job evaluation is on the manner in which evaluation-defined job structures are translated into wage structures. Unions influence wage structures in three ways: (1)they reduce or eliminate rate ranges for each job; (2)where rate ranges exist, they greatly reduce the amount of time required to reach the top of the rate range, and (3) they reduce management's ability to base wages on performance.

<sup>34</sup> Belcher, Compensation Administration, pp. 88-89.

One means by which unions reduce rate ranges is to increase the prevalence of single job rates. In an analysis of Industry Wage Surveys conducted by the Bureau of Labor Statistics, Freeman<sup>35</sup> reports that, in six of the nine four-digit manufacturing industries studied, collective bargaining coverage has a large, positive and significant effect on the percentage of production workers in an establishment covered by single rate plans. Furthermore, in unionized where rate ranges exist plants, the institutional literature<sup>36</sup> asserts that union influence has encouraged automatic or nearly automatic wage progression based on length of service. Because of the rapidity with which individuals in unionized establishments reach the top rate range, many automatic progression plans of а effectively become single rate maxima in the union sector.<sup>37</sup>

There will be some variation across jobs and job ladders in their general human capital requirements, and the differences in general human capital requirements will be reflected by job evaluation points in both the union and nonunion sectors.<sup>38</sup> However, some individuals in the same

- <sup>35</sup> Richard B. Freeman, "Union Wage Practices and Wage Dispersion Within Establishments," National Bureau of Economic Research, Working Paper No. 752, September 1981.
- <sup>36</sup> Slichter et al., pp. 11; 602-604.
- <sup>37</sup> Freeman, "Union Wage Practices," p. 4; and Slichter et al. p. 605. That is, in the union sector, the effect of automatic progression on wages may be indistinguishable from the union effect on the starting wage.

<sup>38</sup> It is also possible that some ports of entry lie within a

job category or labor grade may possess more formal education and previous work experience than is required for the job. Because unions are expected to increase hiring standards above minimum job requirements,<sup>39</sup> greater over-qualification is expected to occur in the union sector than in the nonunion sector. Employee returns to general human capital will, therefore, be reduced by unionism through the greater prevalence of single job rates, and through the increased overqualification of individuals above minimum job requirements which occurs in the union sector.

As noted above, unionism has also reduced management's ability to reward individual differences in performance within a single job category or labor grade by wage increments. Freeman<sup>40</sup> found that union coverage has a significant negative effect on the percentage of production workers covered by merit review plans in four of the nine industries studied, and a significant negative effect on individual determination plans in eight of the nine

- <sup>39</sup> The reasons for expecting increased hiring standards in the union sector will be discussed below.
- **\*\*** Freeman, "Union Wage Practices," p. 10.

job ladder, rather than at the bottom. Such entry ports might be expected to require larger amounts of general human capital. However, unions may limit an employer's ability to assign new hires to jobs within a formal progression. Specifically, if a qualified incumbent on the job below bids for the job, a unionized employer is constrained by seniority rules and may not be able to hire from the outside to fill the vacancy. Seniority rules are expected to be less binding in the nonunion sector.

industries studied. Since individual performance differences are expected to be correlated with differences across individuals in their length of education and previous experience, union-induced reductions in the use of individual determination and merit review plans is an additional channel through which returns to general human capital are reduced in the union sector. In general, the reduction of employee returns to general human capital will be larger as the job rate range is reduced, and when performance differences are strongly correlated with the length of education and previous work experience.

Thus, the magnitude of union-caused reductions in returns to general human capital depends on how individuals who differ in their education and previous work experience are assigned to jobs. In the presence of strong seniority in promotion provisions, employers can be expected to assign new hires to entry-level jobs, insuring that each individual possesses the general human capital required for jobs which lie above the entry port. If the minimum job requirements for education or previous experience increase as one progresses above the entry port, the union-induced reduction in returns to general human capital will be most evident in the starting wage. Initial job assignment also determines the particular job ladder within which each new hire can expect to progress. Consequently, union reductions in returns to general human capital should also be evident throughout an individual's tenure with a unionized employer.

The institutional channels through which unions reduce returns to general human capital have not been carefully analyzed by prior researchers. Rather, the early work simply assumed that unions will reduce returns to all wage determining characteristics. This very general hypothesis has been tested for education and for the total work experience proxy, and the results of these empirical tests appear to support this hypothesis.<sup>41</sup>

The preceding section discussed the implications of unions' influence on job evaluation for employee returns to education and previous experience. Unions' influence on how job structures are translated into wage structures is also expected to affect employee returns to tenure with the present employer. Specifically, the increased prevalence of single job rates, and the extremely rapid progression within rate ranges which occur within the union sector, are expected to eliminate or reduce employee returns to that portion of current employer tenure acquired on the initial job with a unionized employer. All prior work, with the exception of Mincer's, has hypothesized that unions will reduce returns to all work experience, including all tenure. This dissertation differs from all previous studies by distinguishing between union effects on returns to tenure on the initial job, and returns to tenure on subsequent jobs

<sup>&</sup>lt;sup>41</sup> See, for example, Johnson and Youmans, "Union Relative Wage Effects by Age and Education," and Bloch and Kuskin, "Wage Determination in Union and Nonunion Sectors."

with the same employer. This distinction derives from the following analysis of seniority rules.

### Seniority Rules

The enlarged and codified application of seniority rules is another channel through which unionism constrains management discretion in allocating employment, promotion, and other opportunities. Of particular relevance for the purposes of the present study is the increased weight accorded seniority as a criterion governing promotion decisions.

The historical development of that increased weight is of interest in that it demonstrates the influence of collective bargaining as ongoing process, an almost independent of the initial disposition of the parties. Early collective bargaining agreements treated promotion as a non-negotiable issue, subject to employer discretion under the management rights clause. In industries where the attachment of employees was to a particular employer, rather than to an industry or craft, the firm itself became defined as the scope of job opportunities within which employees regarded themselves as having a continuing equity.<sup>42</sup> As the concept of a job as a property right gained adherence, standards for promotion were negotiated reflecting the principle that current employees should be given preference

<sup>&</sup>lt;sup>42</sup> Frederic Meyers, "The Analytic Meaning of Seniority," <u>Proceedings of the 18th Annual IRRA Winter Meeting</u> <u>1965</u>, p. 196.

for advancement over applicants from the outside. However, the relative seniority of two current employees did not carry any particular weight under that contract language. The union role in determining who should receive promotions was enlarged beyond simple preference for current employees when unions won the right to grieve management decisions concerning promotions believed to be discriminatory.<sup>43</sup>

Surveys by the Bureau of Labor Statistics (BLS), indicate that provisions which specify a role for seniority promotion decisions are prevalent in in contracts. especially in manufacturing industries. In 1970, 70 percent of the agreements which were sampled in all industries, contained promotion provisions. Of those contracts with promotion provisions, 93 percent (which covered 95 percent of all workers) specified that seniority was a factor in promotion decisions. Most contracts provided for the joint criteria of skill and ability, as well as seniority, for promotion decisions. Typical provisions specified that if certain minimum standards were met, seniority would become a determining factor.<sup>44</sup> There was, however, considerable variation in the prevalence of seniority in promotion provisions across major industry and occupational groups. In manufacturing industries, 90 percent of all sampled

<sup>43</sup> Slichter et al., pp. 204-206.

<sup>44</sup> U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 1425-11, <u>Major Collective</u> <u>Bargaining Agreements</u>: <u>Seniority</u> in <u>Promotion</u> and <u>Transfer</u> <u>Provisions</u> (Washington, D.C.: U.S.G.P.O., 1970), p. 5.

agreements contained seniority in promotion provisions. This contrasts with a frequency of 43 percent among nonmanufacturing industry agreements. The BLS notes that a large proportion of the difference in the prevalence of promotion provisions between manufacturing and nonmanufacturing contracts may be due to the more common practice of association or multi-employer bargaining in nonmanufacturing industries. Under multi-employer bargaining, all promotion provisions may be excluded from master agreement the as matters most appropriately negotiated by individual employers.<sup>45</sup> Promotion provisions are included in 95 percent of single-firm agreements, in 47 percent of industry or area-wide agreements, and in approximately 30 percent of agreements negotiated with employer associations. 46

While promotion provisions are less frequent in master agreements (which typically cover nonmanufacturing employers), unionized nonmanufacturing employers are equally subject to written policies regarding promotion.<sup>47</sup> A

- <sup>46</sup> U.S. Department of Labor, Bureau of Labor Statistics, <u>Seniority in Promotion and Transfer</u>, p. 3.
- <sup>47</sup> James L. Medoff and Katharine G. Abraham, "The Role of Seniority at U.S. Work Places: A Report on Some New Evidence," National Bureau of Economic Research, Working Paper No. 618, January, 1981, p. 16. Whether all the

<sup>&</sup>lt;sup>45</sup> The BLS does not sample individual employer contracts when employers are party to a master agreement covering multiple employers. However, virtually all agreements covering more than one employer are supplemented by local agreements in order that contracts can be appropriately tailored to local situations and concerns.

nationwide survey of private employers by Medoff and Abraham indicates that: (1)unionized employers in nonmanufacturing industries are as likely to have "a . . . collective bargaining agreement dealing with promotions" as unionized manufacturing employers (79 percent versus 78 percent), and nonmanufacturing (2)that unionized employers are substantially more likely to be subject to a policy stipulating seniority to be the most important factor (73 in nonmanufacturing versus 59 percent percent in manufacturing).

Contracts covering white-collar workers are substantially less likely to assign seniority an important role in determining promotion than are contracts covering blue-collar workers. According to the BLS data, 15 percent of all agreements covering white-collar workers, compared with 42 percent of agreements covering blue-collar workers, specified that seniority was the most important criterion for promotion decisions. Promotion provisions in the few agreements covering professional-technical or sales workers made no reference to seniority as a factor governing promotion. Agreements covering clerical workers were more likely to mention seniority than those covering

definitions used in the Medoff and Abraham study are identical to those used by the BLS survey cannot be determined. Some portion of the difference in the frequency of promotion provisions between the BLS and the Medoff and Abraham surveys is due to the latter survey's questions applying to local supplementary agreements, as well as master agreements.

professional-technical and sales workers, but seniority was usually specified to be a secondary consideration for clerical workers.<sup>48</sup> Several explanations may exist for the BLS findings that seniority provisions are less prevalent and, where they exist, are weaker for white-collar workers: (1)General human capital is more important for white-collar than for blue-collar occupations.<sup>49</sup> (2)Greater ability differences are evident among white-collar workers. (3) The difficulty and less in greater success organizing white-collar workers has reduced the bargaining power of unions to overcome management resistance to the use of seniority in promotion.

### Grievance and Arbitration Provisions

Based on the foregoing discussion, it may be concluded that since the inception of industrial unionism, there has been a substantial increase in the prevalence and strength seniority in promotion provisions applicable of to blue-collar workers in both manufacturing and nonmanufacturing industries. However, the increased strength of the seniority criterion may have occurred not only because of union pressure. Two other factors may also have been at work. First, management may have difficulty in

<sup>&</sup>lt;sup>48</sup> U.S. Department of Labor, Bureau of Labor Statistics, <u>Seniority in Promotion and Transfer</u>, p. 25.

<sup>&</sup>lt;sup>49</sup> George Hildebrand, "External Influences and the Determinants of Internal Wage Structure," in J. L. Meij ed., <u>Internal Wage Structure</u> (Amsterdam: North Holland Publishing Co., 1963), pp. 269-270.

substantiating a judgment of relative ability when its decisions are challenged by the union, and it may recognize that the proper use of the seniority criterion is not necessarily incompatible with efficiency and employee morale. However, management attitudes toward the seniority criterion varies substantially, depending on the relative strengths of union and management; whether management has simply chosen the path of least resistance, or whether management has made an effort to develop sound procedures for evaluating and defending judgments of relative ability.<sup>50</sup> Second, arbitration rulings have had а significant influence in assigning considerable weight to seniority. The influence of arbitration rulings stems from common arbitrator practice in placing on the company the burden of proof regarding the greater ability of a less senior employee.<sup>51</sup> Believing that on-the-job training, seniority, and ability are highly correlated, arbitrators commonly follow the "head and shoulders" principle for blue-collar workers. The "head and shoulders" principle emphasizes the use of seniority in promotion unless obvious ability differences exist.<sup>52</sup> "Interpretation by arbitration rulings...has been the principal method of 'adding meat to

- <sup>50</sup> Slichter et al., p. 202.
- <sup>51</sup> Ibid, pp. 178-210.
- <sup>52</sup> James J. Healy, "The Factor of Ability in Labor Relations," in <u>Arbitration Today</u>: <u>Proceedings of the 8th</u> <u>Annnual Meeting of the National Academy of Arbitrators</u> (1955), p. 53.

the bones of the contract' or, in the words of one disgruntled employer, 'of performing plastic surgery on the language of the promotion clause.'"<sup>53</sup>

The strength of seniority in promotion provisions, based on contract language alone, can be expected to understate the actual use of the seniority criterion in the presence of promotion, grievance, and arbitration provisions. Since 99 percent of all union contracts provide for a grievance procedure, and 95 percent provide for arbitration, there may be less variation in the strength of seniority in promotion provisions for blue-collar workers than is evident from contract language 'alone.' <sup>54</sup>

### Institutional Implications of Seniority in Promotion Provisions

Three general implications follow from the considerable weight accorded to seniority in promotion in the union sector: (1)Unionized employers can be expected to raise hiring standards (in terms of measurable productivity characteristics such as educational attainment) for entry-level jobs, relative to the standards applying to comparable nonunion jobs; (2)The use of seniority in promotion is also anticipated to increase the efficiency of

<sup>53</sup> Slichter et al., pp. 198-203

<sup>&</sup>lt;sup>54</sup> U.S. Department of Labor, Bureau of Labor Statistics, <u>Characteristics of Collective Bargaining Agreements</u>, <u>July</u> <u>1</u>, <u>1975</u>, Bulletin 1957, (Washington, D.C.: U.S.G.P.O., 1977), p. 94

internal labor allocation and the provision of on-the-job training; and (3)Seniority rules tie the probability of receiving a promotion to length of service. Further elaboration of these implications follows.

Unionized employers are expected to increase hiring standards because they are constrained to promote workers primarily on the basis of seniority. Thus, hiring standards in the union sector must be relevant to jobs which are higher in the job progression, rather than simply the requirements of the first job to which a new hire is assigned. Union sector workers hired into entry ports are, therefore, expected to possess more education and previous work experience than new hires in the nonunion sector. Increased hiring standards would not only improve performance on entry jobs, but would also minimize the possibility (and potential costs) of having to promote a poorly qualified employee on the basis of seniority.<sup>55</sup> This reduced probability of promoting an unqualified employee will, however, come at the expense of increased screening costs for unionized employers.

Seniority rules are also expected to increase the efficiency of OJT provision in three ways. First, unionized employers are expected to respond to union insistence upon seniority in promotion by more carefully defining seniority

<sup>&</sup>lt;sup>55</sup> Peter B. Doeringer, "Determinants of the Structure of Industrial Type Internal Labor Markets," <u>Industrial</u> and <u>Labor</u> <u>Relations</u> <u>Review</u>, Vol. 20, No. 2, January 1967, p. 212.

units than they would in the absence of this constraint. Typically, the seniority unit for promotion is derived from the organization of the plant (e.g., section, department, division). Narrow seniority units are used for promotions because there is a high probability that jobs within a narrow unit will be functionally related. Incumbents within the promotion unit will be familiar with the work of the job to be filled through proximity and temporary transfers. In cases where the jobs within an organizational unit are not related, or where the progression from lower to higher paying jobs is not logical, some firms have developed special groupings of jobs in different departments and defined an appropriate progression among them. Regardless how the promotion ladder is defined, efficiency of considerations, in conjunction with the seniority criterion, encourage the design of built-in training opportunities on each job rung.<sup>56</sup> "Career progressions of some kind are the usual, though not the universal concomitant of seniority rules."57

Second, union sector workers should be capable of learning on the job more quickly than their nonunion counterparts, due to the greater stocks of general human capital which union sector workers are expected to possess. This follows from the neutrality assumption of human capital

<sup>56</sup> Slichter et al., pp. 196-197.

<sup>57</sup> Meyers, "The Analytic Meaning of Seniority," p. 201.

theory.<sup>58</sup> Thus, unionized employers should be able to provide a given amount of OJT to new hires and job incumbents in less time and, consequently, at less cost than comparable nonunion employers.

Third, to the extent that the efficient provision of OJT to new hires or promotees requires the cooperation of job incumbents to demonstrate the job and share knowledge, the use of seniority in determining promotion will expedite the training process. Incumbents will not view trainees as a potential threat to their own future upgrading prospects under seniority in promotion provisions and will, therefore, willingly share relevant knowledge with all new hires.<sup>59</sup>

The final implication of seniority in promotion is of greatest importance for the purpose of this dissertation. It is almost definitional to propose that seniority in promotion will tie an individual's probability of receiving a promotion to his or her length of service with the present employer. The manner in which the increased probability of promotion is expected to occur, and the implications of increased promotion probabilities are less obvious. Specifically, seniority provisions will have asymmetrical effects: they will reduce the probability of promotion for

<sup>&</sup>lt;sup>58</sup> The neutrality assumption states that as the stock of human capital increases (and hence the value of time), the percent of work time required to produce a given amount of human capital decreases sufficiently so that the total cost of human capital production remains unchanged.

<sup>&</sup>lt;sup>59</sup> Doeringer and Piore, <u>Internal Labor Markets</u>, p. 87.

low seniority (or tenure) workers, regardless of the guality of their performance, but will increase the probability that high seniority workers will receive a promotion. This increase in promotion probabilities for high seniority with union-induced workers, together reductions of employee-initiated guits, <sup>60</sup> and the consequent increase in current employer tenure, leads to a further effect: on average, more union sector employees will be promoted than their nonunion sector counterparts during their tenure with a unionized employer. The hypothesis that a greater proportion of union sector employees will receive a promotion has, in turn, important implications for the type and amount of on-the-job training unionized workers will receive. This issue is explored in the following section.

Before proceeding to a discussion of expectations regarding union effects on OJT, it will be useful to recapitulate the argument which has been developed thus far.

<sup>&</sup>lt;sup>60</sup> Freeman, "The Effect of Unionism on Worker Attachment to Firms," pp. 29-61. This finding, based on analysis of data pertaining to the entire age range, does not hold as strongly for young men. Freeman's estimates using the NLS sample of young men is smaller, though still significant. Farber, using the same data, but different econometric techniques, finds an insignificant effect of unions to reduce quits for this age group. See Henry S. Farber, "Unionism, Labor Turnover, and Wages of Young Men," in Ronald G. Ehrenberg, ed., Research in Labor Economics, vol. 3, (Greenwich, Conn.: JAI Press, 1980): pp. 33-53. Farber suggests this difference is due to the relative importance of tenure-conditioned fringe benefits for older workers in the union sector. Since younger workers in the union sector necessarily possess fewer tenure-conditioned benefits, unionism is not expected to exert as strong an influence on their quit behavior.

The manner in which evaluation-defined job structures are translated into wage structures in the union sector is expected to reduce employee returns to education and previous work experience. This occurs through the increased prevalence of single job rates and the reduced prevalence of merit review and individual determination plans. Additionally, job evaluation under unionism is expected to reduce employee returns to the segment of current employer tenure acquired on the initial job or entry port, via single job rates, and very rapid automatic wage progression within rate ranges. Finally, the greater strength of seniority in promotion within the union sector is expected to increase hiring standards, to increase the efficiency of OJT provision, and to increase the proportion of unionized employees who receive a promotion during their employment with the firm, relative to a comparable group of nonunion employees.

### Price-Theoretic Responses of Unionized Employers to Negotiated Wage Increases

Considering the institutional constraints on wage structure and internal mobility which result from union organization, how can unionized employers be expected to respond to a negotiated wage increase above competitive levels? Principal employer responses are expected to involve the provision and financing of on-the-job training (OJT).

There are four analytically distinct aspects of OJT, all of which are potentially influenced by the unionization of an employer's work force. These dimensions of OJT are: (1) the degree of firm specificity, (2) the proportions of the cost borne by employer and worker (i.e., the relative financing shares), (3) the total amount of OJT, and (4) the time intensity of OJT. Empirical analysis of all dimensions of OJT is, to varying degrees, impeded by the absence of direct measures. Hypotheses regarding union effects on the degree of firm specificity, and the relative financing shares of OJT, can be formulated by reliance on human capital theory and the institutional literature on unionism. Since the issue of the time intensity of OJT derives no quidance from either source, it will not be directly examined, but will be assumed fixed across comparable jobs in union and nonunion sectors. As a result of the variety of opposing forces unionism can be expected to exert on the total amount of OJT provided, and because of the substantial latitude which unionized employers possess, the net effect of unions on total OJT appears to be indeterminate.

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# Employer Responses Affecting the Firm-Specificity of On-the-Job Training

There are two principal channels through which unionism is expected to alter the firm specificity of on-the-job training provided to individuals covered by a collective bargaining agreement. These channels are the

union-negotiated wage increase above competitive levels, and seniority in promotion provisions. Union wages and seniority rules are expected to induce unionized employers to provide less general, but more specific, OJT to their workforces than nonunion employers in the same industry.

The preceding section discussed the expectation that the greater importance of seniority for promotion decisions in the union sector increases hiring standards. Two additional union effects will contribute to the same result. First, due to the higher union wage, union sector employers will be able to attract more highly skilled employees.<sup>61</sup> Second, the greater prevalence of single job rates, and the reduced prevalence of merit review and individual determination plans imply that the marginal cost of an additional unit of skill above minimum job requirements is lower for union than for nonunion employers.<sup>62</sup>

<sup>&</sup>lt;sup>61</sup> This effect of unionism was first recognized by H.G. Lewis, <u>Unionism and Relative Wages in the U.S.</u> (Chicago: University of Chicago Press, 1963), pp. 45-46.

<sup>&</sup>lt;sup>62</sup> Recent empirical work testing the proposition that unionism induces an increase in hiring standards confirms this expectation. See, for example, Edward Kalachek and Fredric Raines, "Trade Unions and Hiring Standards," Journal of Labor Research, vol. 1, no. 1 (Spring 1980): 63 - 75; Charles Brown and James Medoff, "Trade Unions in the Production Process," Journal of Political Economy, vol. 86, no. 3 (June 1978): 355 - 378; and Lawrence M. Kahn, "Unionism and Relative Wages: Direct and Indirect Effects," Industrial and Labor Relations Review, vol. 32, no. 4 (July 1979): 520 - 532.

Increased hiring standards in the union sector should have a direct impact on the amount of general OJT provided. Specifically, unionized employers will hire individuals with more general human capital, and will consequently provide less general OJT per worker. Lower quit rates will also reduce the total amount of general OJT provided. Fewer guits will reduce the number of workers who must be hired in order to maintain a given size workforce. New hires should receive proportionately more general or "replacement" training, while promotees should receive proportionately more firm-specific than general training.<sup>63</sup> Therefore, unionization is expected to reduce the number of workers requiring a large proportion of general training via reduced quits, and to reduce the amount of general training to be provided per worker via increased hiring standards.

It is tempting to project the expectation regarding union effects on the amount of general OJT provided by the employer to the amount of specific OJT provided. By analogy, the union wage effect and compressed skill differentials might be expected to increase unionized employers' ability to hire individuals who already possess highly related skills, <sup>64</sup> and consequently reduce the amount

<sup>&</sup>lt;sup>53</sup> See Charles L. Shearer, "Union Effects on Quit Rates and Training," Ph.D. dissertation, Michigan State University, 1981, for a discussion of the relative specificity of OJT received on entry-level and subsequent jobs.

<sup>&</sup>lt;sup>64</sup> Clearly, this instance does not refer to firm-specific training since, by definition, there does not exist an external supply of labor with firm-specific skills.

of specific training provided on the job. Since providing OJT is costly, unionized employers would prefer to use this strategy. They may, however, be limited in their ability to hire individuals with highly related skills.

Since unionism reduces the quit rate, fewer job seekers will be available from other unionized firms in the same industry. It follows that the greater the union penetration of an industry, the more restricted the supply of job seekers with skills specific to the industry will be.<sup>65</sup> In addition, seniority in promotion provisions in the union sector limit the supply of workers coming from the external labor market. If a vacancy occurs within a promotion sequence and an incumbent in the job below the vacancy is qualified, a unionized employer would be forced to promote the incumbent rather than hire from the outside. This is not to suggest that a unionized employer is prohibited from

However, since there are varying degrees of skill specificity, it would be possible for employers to economize on training costs by hiring individuals who possess skills which are at least industry-specific.

<sup>55</sup> However, a recent study of labor mobility within and between union and nonunion sectors found that, among job leavers, one-half of young and two-thirds of older workers who quit a union sector job found other union sector jobs. This compares with less than ten percent of nonunion sector job leavers who found union sector jobs. See Mincer, "Union Effects," p. 21. No information was provided on industry changers and leavers. The differential between union and nonunion sector job leavers who find another unionized job may simply reflect the greater hiring standards of unionized employers and the effects of individuals' opportunity wages. It may, also indicate that unionized employers do however, attempt to hire individuals with highly related skills when possible.

hiring available individuals with highly related skills, but rather, to suggest that the employer is prevented from assigning new hires to jobs which lie above an entry port.

Seniority rules are expected to play an affirmative role, as well as a restrictive one, in increasing the amount of firm-specific training to be provided on the job. As already hypothesized, seniority in promotion provisions, together with the union-induced quit reduction, are expected to increase the probability that individuals will receive a promotion during their employment period with the firm. Furthermore, the advanced training required for jobs above an entry port will be primarily firm-specfic. A greater proportion of new hires into unionized firms are expected to be promoted during their tenure with the current employer, and thereby, to receive more specific OJT than do comparable nonunion workers.

Unionism should also reduce the employer's cost of providing a fixed amount of OJT through a number of channels. First, the greater stocks of general human capital possessed by a unionized employers' workforce should reduce the time required to absorb a given amount of training. Second, the lower quit rates experienced by unionized employers should reduce the sunk costs associated with providing training to workers who subsequently quit. Third, the institutional influences of seniority rules, including the greater willingness of incumbents to train

co-workers, due to the reduced threat to their own future upgrading prospects, and the incentive of employers to build required OJT into job progressions, should also reduce the costs of providing training.

In a recent study examining union effects on OJT, Mincer concluded that unionism will reduce the amount of general training which is provided, because investments in general training are not adequately rewarded within unionized firms. He believes that unions will reduce the amount of general OJT due to both the compression of skill differentials, and to the fact union workers are less likely to change employers in the first place. He postulates that, by reducing quit rates, unionism might increase the amount of specific training provided, as a result of the reduced risk of capital loss to the employer. However, he rejects this conclusion because permanent layoff rates are no smaller in the union than the nonunion sector. Clearly, employers would be reluctant to lay off individuals in whom substantial amounts of specific training had been invested. Mincer's rejection of this conclusion fails to recognize the importance of institutional channels of influence, and seniority provisions in particular.

As stated earlier, seniority in promotion provisions: (1) increase the probability of receiving a promotion at high levels of tenure, but decrease the probability of receiving a promotion at low levels of tenure, and (2)

increase the amount of specific OJT most workers receive, as a direct consequence of restricting promotion to senior incumbents who must be given the advanced training required to fill the job. Conversely, seniority in layoff provisions substantially reduce the probability of layoff at high levels of tenure, while increasing layoff probabilities at low tenure levels. Thus, while unionized employers will seek to minimize the amount of specific training provided to low tenure workers (e.g., on the initial job), the asymmetrical benefits of seniority rules should, in fact, protect and encourage investments in specific training for individuals who have accrued substantial tenure. Seniority in layoff provisions, even with equal permanent layoff rates in union and nonunion sectors, insure that layoffs will be concentrated among union sector employees who possess the least specific training. In sum, by reducing an employer's ability to hire individuals with highly related skills for non-entry level jobs; increasing the number of job incumbents who receive promotions during their tenure with an employer; reducing the costs of OJT provision; and insuring that layoffs are concentrated among individuals with the least specific training, collective bargaining coverage is expected to increase the amount of specific OJT provided to relatively senior workers.<sup>66</sup>

<sup>&</sup>lt;sup>56</sup> There exists an additional channel, unrelated to seniority provisions, through which unions are also expected to increase the amount of specific OJT the average worker receives. In the nonunion sector,

## Employer Responses Affecting OJT Financing

Before analyzing the way collective bargaining coverage is expected to influence the relative financing shares by firm and employee of specific on-the-job training (that is, the proportion of OJT costs each party absorbs), it is useful to briefly summarize the competitive analysis. For jobs in which no OJT is provided, a worker's value of marginal product (VMP) is determined solely by his or her attainment. educational This determination ignores differences luck and in ability across individuals. Assuming the absence of human capital depreciation due to aging and skill obsolescence, an individual's wage will be equal to his or her VMP over the length of tenure with an employer. In addition, the individual's wage and VMP will not change over time. For jobs in which OJT is provided, in contrast, the value of marginal product of a new hire is initially depressed. The direct costs to the employer of supervisor and incumbent employee time spent with the trainee, and substandard production during the training period, must be subtracted from the trainee's value of output to determine VMP. The difference between the value

implicit labor contracts involving specific training are vulnerable to threats. That is, an individual possessing a large stock of specific capital can threaten to quit unless paid the full value of marginal product. See John Kennan, "Bonding and the Enforcement of Labor Contracts," <u>Economics</u> <u>Letters</u> 3 (1979): 61-66. Since individual bargaining is precluded by law in the union sector, collective bargaining agreements provide a means of enforcing specific training contracts.

of marginal product in the absence of OJT and in its presence constitutes the total cost of on-the-job training.

Individuals will share in OJT financing by accepting a lower wage than is obtainable for a job with equal educational requirements, but without on-the-job training. Employers will also share in the financing of specific training by setting the starting wage above the VMP of new hires. Under competitive (nonunion) conditions, shared investment is required as the primary, if not the only means of reducing separations initiated by either party. Shared financing imposes costs on either party if the employment relation is severed.

When a firm becomes unionized, the initial contract negotiation will generally increase the wages for all jobs, including the wages for entry-level jobs and new hires, above competitive nonunion levels. Since technology is fixed in the short-run, negotiations will increase the wedge between the VMP and the wage rate. A larger wedge between the wage and VMP implies, <u>ceteris paribus</u>, that unionized employers will initially finance a greater proportion of the costs of OJT and will receive an equivalent proportion of the returns from this investment.<sup>67</sup> The greater employer financing share in the union sector is also tenable in the

<sup>&</sup>lt;sup>67</sup> That each party's share of the costs of OJT must be equal to its share of the returns is required for competitive equilibrium. See Ann P. Bartel and George J. Borjas, "Specific Training and Its Effects on the Human Capital Investment Profile," <u>Southern Economic Journal</u> 44 (October 1977), p. 335.
long-run. First, unions are expected to reduce the amount of general training provided, but to increase the amount of specific training provided. Because specific training elicits shared financing, but general training does not, an increased share of OJT financing by employers will follow from this altered composition of OJT alone. Second, although the reduced share of employee financing and returns might induce an unacceptable increase in worker quits in the nonunion sector, union-induced quit reductions provide unionized employers greater latitude for OJT financing arrangements. "Any condition that reduces the probability of a worker's quitting...will increase the willingness of the employer to pay for OJT."68 Indeed, Mincer observes that, in contrast to the competitive case where shared financing causes a reduction in quits, in the union sector it is the union-induced quit reduction which will stimulate shared investment in OJT.<sup>69</sup> In other words, unionism reverses the direction of causality between quits and shared financing.

Union-caused shifts in the composition of OJT between general and specific training, shifts in the timing of OJT provision ( $\underline{i} \cdot \underline{e}$ , away from the initial and toward subsequent jobs), and the modified financing of OJT, have a number of

<sup>&</sup>lt;sup>58</sup> Belton M. Fleisher and Thomas J. Kniesner, <u>Labor</u> <u>Economics</u>: <u>Theory</u>, <u>Evidence</u> and <u>Policy</u> (Englewood Cliffs: Prentice-Hall, Inc., 1980), p. 316.

<sup>&</sup>lt;sup>69</sup> Mincer, "Union Effects," p. 39.

implications for employee returns to OJT as measured by the human capital earnings power function. If unionization increases the proportion of OJT financed by employers, as hypothesized above, but leaves both the total amount of OJT received in comparable jobs and the expected tenure with the firm unchanged, measured (and actual) employee returns to OJT will be lower in the union than in the nonunion sector. Lower employee returns to OJT need not result from union reductions of the amount of OJT which is provided. Rather, lower employee returns may be due to the smaller share of unionized employee financing. Previous findings of lower returns to age or the total work experience proxy for unionized workers do not necessarily imply that "the rate of growth of the stock of human capital of a union worker will be less than that of a nonunion worker."<sup>70</sup> In fact, the use of experience proxies are likely to confound a number of union influences, including the union reduction in returns employees receive for their general human capital.

Furthermore, since unionism significantly increases current employer tenure,<sup>71</sup> and thus the expected payoff period for OJT investment, the greater share of employer-financed OJT need not be fully compensated through a proportionate reduction per unit of time of employee

<sup>&</sup>lt;sup>70</sup> Johnson and Youmans, "Union Relative Wage Effects by Age and Education," p. 176.

<sup>&</sup>lt;sup>71</sup> Freeman, "The Effect of Unionism on Worker Attachment to Firms."

returns to present employer tenure. Finally, if unionization has opposing effects on the various segments of current employer tenure, even the use of direct measures of total current employer tenure will confound two opposing union effects. These considerations suggest that care be taken in the specification and interpretation of the empirical model, which are discussed in Chapter IV.

# Employer Responses Affecting the Total Amount of OJT Provided

It is hypothesized above that unions reduce the amount of general OJT and increase the amount of specific OJT provided. If so, the net effect of unionism on total OJT depends on whether specific OJT will increase sufficiently to offset the decline in general training.

Based on purely price-theoretic considerations, when unions increase wages above workers' current value of marginal product, unionized employers are expected to respond by increasing labor productivity. Temporarily ignoring possible institutional effects, union sector employers face two not mutually exclusive options: (1) to increase the human capital stock of the work force, and (2)to increase the capital/labor ratio.

As previously discussed, unionism is expected to increase the human capital stock of an employer's workforce through increased hiring standards. However, recent

research confirming this expectation,<sup>72</sup> also reports that these union-induced hiring standards are by themselves insufficient to substantially offset the union wage effect. The greater the stock of general human capital which individuals possess, the more productive they are in acquiring additional training. Therefore, increased hiring standards should have a positive effect on the amount of training provided on the job.

Collective bargaining coverage is also expected to increase the capital intensity of production, as noted above. Greater capital intensity follows from union-induced increases in labor costs, which leave the costs of capital unchanged. Unions thereby induce substitution of capital for labor inputs.

The relevant questions, then, are: Will the increased capital- intensity of production in the union sector affect the skill-intensity of production among blue-collar workers?<sup>73</sup> If so, in what manner? Although a substantial literature exists which examines capital-labor and labor-labor substitution, it provides no direct evidence on the questions posed.<sup>74</sup> Specifically, although almost all of

<sup>72</sup> Kalachek and Raines, "Trade Unions and Hiring Standards."

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<sup>&</sup>lt;sup>73</sup> It is relevant to inquire about increased skill-intensity for blue- collar workers, e.g., substitution between skilled crafts and operatives, since blue-collar workers are the vast majority of private sector unionized employment.

<sup>&</sup>lt;sup>74</sup> See Daniel S. Hamermesh and James Grant, "Econometric Studies of Labor-Labor Substitution and Their

the studies have disaggregated labor into production and non-production workers, none have disaggreated production workers by skill level to determine whether differences in substitutability or complementarity with capital exist between, for example, operatives and skilled craftspeople. A study investigating the process by which manufacturing firms design and select production techniques provides evidence that, while industrial engineers have a strong bias against labor-intensive technology, they neglect possibilities of substitution among labor grades.<sup>75</sup>

The union-induced increase in capital intensity reduces unionized firms' demand for production labor to produce a given amount of output. It is not clear what effect, if any, capital intensity has on the total amount of OJT received by production workers.<sup>76</sup> On one hand, ignoring

Implications for Policy," <u>Journal of Human Resources</u>, vol. 14, no. 4 (Fall, 1979): 518 - 542 for an extensive review and appraisal of this literature.

- <sup>75</sup> See Michael J. Piore, "The Impact of the Labor Market Upon the Design and Selection of Productive Techniques within the Manufacturing Plant," <u>Quarterly Journal</u> of <u>Economics</u>, vol. 82, no. 4 (November 1968): 602 - 620.
- <sup>76</sup> Duncan and Stafford hypothesize that greater capital intensity in the union sector will reduce the amount of OJT received by union sector workers, inducing instead job simplification, more structured work settings, inflexible hours and faster work pace. However, the proposition that inter-industry differences in capitalintensity create working conditions which are conducive to unionization is central to their argument. That is, their unit of analysis is across industries, while the focus of this work is on internal labor markets. Therefore, whatever the merits of their approach, it is not relevant for the purposes of this study. Greg J. Duncan and Frank P. Stafford, "Do Union Members Receive

substitution possibilities among labor grades when new technology is introduced implies that management may in fact neglect opportunities to "de-skill" jobs, thereby reducing the amount of training required. In addition, wage rates for new jobs, and often job design as well, are subject to union review and arbitration.<sup>77</sup> If unions pursue member interests, they will pressure management to keep job simplification to a minimum. Job simplification would directly affect the labor grade to which the new job was assigned, and would consequently affect the job rate.

On the other hand, there are some technologies which necessarily reduce the skill content of jobs, such as computerized tool and die machines. Even in this latter instance, however, the type of skill reduced is that which is acquired through formal training and/or apprenticeship,  $(\underline{i}.\underline{e}.,$  general human capital) rather than the specific OJT necessary to learn to operate the equipment. Therefore, although unionization is expected to reduce the amount of general training, it is not clear to what extent the union-induced increase in capital intensity is capable of reducing the amount of specific training which is required.

Compensating Wage Differentials?" <u>American</u> <u>Economic</u> <u>Review</u>, vol. 70, no. 3 (June 1980): 355 - 371.

<sup>&</sup>lt;sup>77</sup> Pike and Fisher, Inc., <u>Steelworkers Handbook of</u> <u>Arbitration Decisions</u> (Pittsburgh: United Steelworkers of America, 1960), pp. 63 - 83; 200 - 207.

Being unable to identify any theoretical or institutional channel through which unionism is expected to exert a strong effect, in either direction, on the total amount of OJT provided, the effect of collective bargaining coverage on the total amount of OJT may be indeterminate. However, unions are expected to alter the composition of OJT away from general and toward specific training for all In addition, low tenure workers are expected to workers. receive less total OJT, since union sector employers will seek to minimize the amount of specific training provided to individuals who have high probabilities of layoff; high tenure workers are expected to receive more specific OJT. It cannot be determined whether the increase in specific training for high tenure workers is greater than the reduction of general training for new hires.

These hypothesized shifts in the composition and incidence of OJT by tenure level should contribute to an understanding of union effects on internal labor market dynamics. Specifically, due to greater use of single job rates and minimization of the amount of OJT provided to individuals with high layoff probabilities in the union sector, collective bargaining coverage is expected to reduce employee returns to tenure on the initial job assignment. Unions are, however, expected to increase employee returns to tenure on subsequent jobs with an employer. The union-induced increase in employee returns to tenure on

subsequent jobs is expected to result from both the receipt of promotion itself, and the concomittant advanced OJT which the promotee must be provided.

## Summary

In this chapter, hypotheses have been developed to explain how collective bargaining coverage affects the acquisition of and returns to human capital for bargaining unit members. The primary channel through which union influence is exerted is seniority rules. In response to the constraints unions impose by means of seniority rules, as well as the union wage effect, employers in the union sector are expected to reduce the amount of general training provided on all jobs, and to increase the amount of specific training provided to individuals on jobs which lie above entry ports. As a result of the altered composition of OJT, union-induced quit reductions, and the union wage effect, employers are expected to finance a greater proportion of OJT and, consequently, to receive a greater proportion of the returns from OJT. In addition, bargaining unit members are expected to receive lower returns to formal education and the work experience which is acquired in the external labor market.

### CHAPTER IV

# HYPOTHESES AND EMPIRICAL SPECIFICATIONS, DATA, AND METHODOLOGY

Human capital theory provides the core of the empirical models developed in this chapter, and tested in Chapter V.<sup>78</sup> Training increases labor productivity and therefore the present value of the expected earnings stream. Consequently, the types and amounts of training in which individuals invest are major determinants of the wages they receive. All measures of human capital are expected to have a positive effect on wages.

Specification of the empirical models used in this dissertation differs in two respects from the bulk of studies which utilize a human capital core to estimate First, the models used here include observed wages. measures which differentiate between experience work experience acquired with all previous employers (PREV), and experience or tenure with the present employer (TEN). In contrast to prior studies which employ various proxies for total work experience, the specification used here allows

<sup>&</sup>lt;sup>78</sup> See Gary S. Becker, <u>Human Capital</u> (New York: National Bureau of Economic Research, 1964), and Jacob Mincer, <u>Schooling</u>, <u>Experience</u> and <u>Earnings</u> (New York: National Bureau of Economic Research, 1974) for a complete explication of human capital theory.

the two experience components to differ in the amount of specific training which is relevant to the current employer. Such a specification will capture the discontinuous increase in the human capital investment ratio which is expected to occur when an individual changes employers. An increase in human capital accumulation is expected, so that an individual's stock of general training (from PREV) can be with the specific training necessary for augmented acceptable performance with the new employer. When a measure of OJT is not included in the model, both the amount of OJT, and employee returns from that investment, must be inferred from the coefficients of PREV and TEN, because the amount of OJT received in each experience segment is not observed. An empirical specification is developed which is appropriate in the absence of an OJT measure, and will be referred to as the Experience Model.

In the preceding chapter, hypotheses were developed which predict that unionization will alter the employers' and employees' shares of OJT financing and the firmspecificity of OJT. If these expected changes occur in the union sector, the estimated tenure coefficient in the union sector Experience Model will not differentiate among union effects on employees' share of OJT financing, on the degree of firm specificity, and on returns to a given amount of employee-financed OJT. Including an observed measure of total OJT will assist in distinguishing between these

effects, but will require a second modification of the typical human capital earnings power function. The Training Model is developed in order to incorporate a measure of OJT.

The Experience and Training Models will be estimated. This will facilitate comparisons with other empirical work, and will aid in assessing whether the addition of an OJT variable contributes to a better understanding of union effects on employee investment in and returns to human capital.

Because this dissertation focuses on the channels through which unions alter the wage determination process within firms, it is appropriate to examine whether incorporating institutional detail will yield greater insight into this issue. Labor economists in the industrial relations tradition contend that all unions are not alike, and imply that differences in, for example, union history and bargaining strength produce systematic variation in the size, if not the direction, of union effects. Furthermore, the hypotheses developed in this dissertation rely upon union codification of seniority rules governing promotion. Whether unions differ in the strength of seniority rules which they negotiate, and whether these seniority provisions are the channel through which unions influence wage determination, are propositions which should be empirically tested.

Two groups of empirical analyses will be produced. The first group estimates separate equations for union and nonunion sectors. Statistical tests comparing union and nonunion coefficients will yield estimates of average union effects. For the second group of analyses, an index reflecting the strength of seniority in promotion provisions (SENINDEX) is constructed and is incorporated into the models. These SENINDEX Models will provide evidence whether union effects on wage determination differ according to the strength of seniority in promotion provisions, and whether seniority rules are the channel through which unions exert their influence.

## Theoretical Predictions: Human Capital Theory

## The Experience Model: Human Capital Core

Individuals decide to invest in on-the-job training based on the expected rate of return from the investment. Expected returns to OJT investments are a function of the payoff period for the investment. The payoff period is determined by whether training is general or firm-specific.<sup>79</sup>

<sup>&</sup>lt;sup>79</sup> Whether training is general or specific also determines how it is financed. A straightforward proposition of human capital theory is that general training is entirely employee financed, while employer and employee share in the financing of specific training.

Completely general skills are equally productive in all firms. Because general training is as portable as the worker possessing it, the payoff period is the remaining working life. The essence of the specific human capital concept is that workers of the same general skill class are differentiated by experience in a particular firm's operations. Completely firm-specific training increases productivity only during the period of employment with the firm in which the training is acquired, and the payoff period is tenure with the current employer.

Skills acquired through the accumulation of work experience are a mixture of general and specific training. The distinction between general and specific training acquired with work experience cannot be completely precise. However previous work experience (PREV), and tenure with the present employer (TEN), differ systematically in the specificity of training relevant to an individual's productivity with the current employer. Only the general training acquired through PREV augments productivity with the current employer, while TEN consists of both general and relevant specific training.

The factors which determine the costs and benefits of human capital investment lead to the assumption of a linearly declining investment ratio over the payoff period. Investment in general human capital declines over the entire period of working life. Investment in firm-specific human

capital, however, declines within each work experience segment. Job mobility tends to precipitate a discontinuous increase in specific training because the expected time remaining on the job--the relevant payoff period--has increased.<sup>80</sup> The concavity of wage-experience profiles follows from this expected investment pattern.<sup>81</sup> The expected decline in human capital investment within each experience segment may be modelled by including the squares of both experience components (PREV<sup>2</sup> and TEN<sup>2</sup>) in the equation. The squared experience variables are expected to have negative effects on wages.

Disaggregating total work experience into PREV and TEN allows the differential specificity of OJT received within each experience segment to be reflected in their respective coefficients. However, the inclusion of PREV and TEN will not suffice for proper specification of the model because the amounts of general and specific training received on the current job are expected to depend on PREV. This dependence of OJT on PREV can be modelled by including an interaction term between PREV and TEN (PREV\*TEN).<sup>82</sup>

- <sup>80</sup> Bartel and Borjas, "Specific Training and Its Effects on the Human Capital Investment Profile," p. 338.
- <sup>81</sup> Observed wages are initially depressed (<u>i.e.</u>, net of foregone earnings), but rise more steeply over time than in the absence of human capital investment (since they include returns on investment in previous periods).
- <sup>82</sup> For a discussion of this issue see Einar Hardin, "Disaggregating the Work Experience Measure in an Earnings Equation," <u>Proceedings of the American</u> <u>Statistical Association</u>, (1978): 616 - 620.

Investment in general training will decline as PREV increases via two distinguishable effects. Since general training acquired through PREV is fully transferable, there will be a decline in general OJT investment on subsequent jobs as this optimal stock of general human capital is approached. Also, since age and previous experience are positively correlated, the larger PREV is, the shorter the payoff period for investments in general training will be. Hence, as retirement approaches, and PREV is quite large, investment in general OJT on the current job will decline.

The expected dependence of specific OJT investment with the current employer on PREV is less determinate than is the dependence of general OJT investment on PREV. Consistent with the expectation for general training, the effect of a finite working life is expected to reduce the amount of specific training with the current employer. However, because gains from mobility decline with age, and because quit probabilities are lower for older than younger workers, the length of time remaining with the present employer (the relevant payoff period for specific OJT) will depend positively on PREV within some age range. Specific OJT investment is expected to depend positively on PREV as a result of the negative relationship between age and quits. Also, since general training cannot be substituted for specific training, PREV is not expected to reduce investments in specific training through its contribution to

the stock of general training. Indeed, again within some age range, PREV is expected to increase investment in specific training by increasing individual productivity in human capital acquisition, thereby reducing employers' training costs.

Considering both the negative and positive dependence of OJT with the current employer on PREV, it would appear that the net effect of PREV\*TEN should be indeterminate. Yet, since the positive dependence of OJT on PREV is applicable only to specific training, and is operative within a restricted age range, PREV\*TEN is expected to have a negative effect on wages.

The human capital core of the Experience Model and the hypothesized effects of the independent variables on wages (W) are summarized below:

The Training Model: Human Capital Core

When a measure of on-the-job training is observed, the specification of the human capital core requires further modification. Total tenure with the present employer can be disaggregated into three segments: tenure with the present employer prior to the present position (PRETEN), on-the-job training obtained in the present position (OJT), and post-training tenure (POSTEN). Note that the sum of the three components is equal to total present employer tenure (TEN = PRETEN + OJT + POSTEN), and that the OJT measure relates only to training received through POSTEN. As is the case with total tenure, all three tenure components are expected to have positive effects on wages.

Including the three tenure segments in the Training Model should provide additional information for testing a number of the propositions developed in Chapter III. The Training Model specification allows individual mobility within the firm to be observed.<sup>83</sup> Individuals who are no longer in their original entry-level position will have a positive value for PRETEN, while individuals who are still in their initial position will not have a positive PRETEN value. PRETEN should, therefore, control for internal mobility, and capture the effects of mobility which are unrelated to the other tenure segments.

As stated in Chapter III, individuals are expected to receive more general training in the initial or entry-level job than in the job received through promotion. The Training Model will allow such differential specificity to be reflected in the coefficients of PRETEN and POSTEN. Since OJT received through PRETEN is not observed, the PRETEN coefficient will capture the effects of the amount of OJT received and employee returns to OJT. Thus, the PRETEN variable will control for internal mobility; capture the

<sup>&</sup>lt;sup>83</sup> It is not possible to determine the direction of this mobility, <u>i.e.</u>, an upgrade or promotion, a lateral move, or a downgrade.

effect of the amount of OJT received in the initial position; and reflect returns to totally employee-financed general training and to employee-financed specific training.

The OJT measure pertains to training received on the current job or POSTEN. Depending on whether the individual has changed jobs within the firm, the current job may be either the initial or a subsequent job with the current employer.<sup>84</sup> The coefficient of OJT may be interpreted as the "lump sum" skill differential which is obtained for a given amount of on-the-job training. By holding OJT constant, the coefficient of POSTEN can be interpreted as the returns to employee-financed OJT which accrue over time.

The amounts of general and specific training acquired through OJT must be allowed to depend on previous experience in the Training Model, as well as in the Experience Model. PREV\*PRET and PREV\*POST are included to reflect this dependence. PRETEN should contain less specific training than POSTEN, since PRETEN always refers to time in the initial or entry-level position. Because general training is expected to depend negatively on PREV, PREV\*PRET is expected to have a negative effect on wages. However, POSTEN refers to the initial job for employees who have not moved within the plant, and to the subsequent position for

<sup>&</sup>lt;sup>84</sup> Note that, for individuals who have had more than one position with the current employer, the OJT measure will understate of the total amount of OJT received, since training received on the initial job is not observed in this case. This data limitation will be controlled for with the PREV\*PRET variable discussed below.

individuals who have moved within the plant. Thus, POSTEN is expected to consist primarily of specific training for internal movers, but not for nonmovers. Since POSTEN refers to both the entry-level and the subsequent job, and since the amount of specific training is expected to depend positively on PREV only within a restricted age range, the net effect of PREV\*POST on wages is also expected to be negative. Because the tenure segments in the Training Model are relatively short, and OJT investment is allowed to depend on PREV through PREV\*PRET and PREV\*POST, the squares of PRETEN and POSTEN are not included in the Training Model. Since OJT which is acquired through previous work experience is not observed, PREV<sup>2</sup> is included in the model to reflect the expected decline in OJT investment over time within The human capital core of the Training Model and PREV. expectations of each variable's effect on wages are summarized below.

W = f(ED, PREV, PREV<sup>2</sup>, PRETEN, OJT, POSTEN, PREV\*PRET, PREV\*POST, X)
+ + - + + - - + + - - where X represents a vector of control variables.

# Average Union Effects on Returns to Human Capital

The institutional and theoretical framework developed in Chapter III must be translated into specific predictions which correspond to the Experience and Training Model specifications. Such prediction begins with a discussion of union effects on returns to general human capital, or ED and PREV, since these variables do not change across specifications. Because unions are expected to have a variety of complex effects on employee returns to tenure, emphasis will be placed on the ways in which the Training Model will allow these effects to be distinguished.

Unions are expected to exert their influence on returns and PREV through union participation in to ED job evaluation. By increasing the prevalence of single job rates, and reducing the prevalence of merit review or individual determination plans, unions alter the way evaluation-defined job structures are translated into wage Union structures. sector wage structures limit an employer's ability to base wages on individual characteristics, including differences in productivity. Relative to the nonunion sector, wage dispersion will necessarily be reduced in the union sector, since personal differences in education and previous experience above the minimum job requirements will not be fully reflected by single job rates. At the same time, unions are expected to increase employers' hiring standards beyond those which are required for the performance of entry-level jobs. Consequently, collective bargaining coverage is expected to reduce the returns employees receive for ED and PREV, relative to comparable nonunion workers.

As hypothesized in Chapter III, unions are expected to affect employee returns to current employer tenure by

causing employers to reduce the amount of general training provided on the entry-level job, and to increase the amount of specific training provided on jobs received through promotion. The reduction in general training in unionized firms is expected to occur through increased hiring standards. In addition, most general OJT will be acquired in entry-level positions. Conversely, an increase in specific OJT is expected to accrue only to those individuals who have accumulated sufficient seniority to protect them from permanent layoff. The additional specific training will be provided when they are promoted to a higher-rated These expectations have direct implications for iob. hypotheses regarding union effects on returns to PRETEN and POSTEN.

Collective bargaining coverage is expected to reduce employee returns to PRETEN relative to the returns comparable nonunion workers receive for three related reasons. First, unions are expected to reduce the total amount of OJT received in entry-level positions by reducing the amount of general OJT, and not increasing the amount of specific OJT which is provided on entry-level jobs. Second, because unions are expected to induce very rapid progression to the top of the rate range (where ranges exist), unions are expected to reduce employee returns to PRETEN. Finally, the OJT received during PRETEN is not observed, so the union-induced increase in the employer's share of OJT financing may be subsumed in the PRETEN coefficient.

The expectation that unions will increase employer financing of a given amount of OJT implies that the coefficient of OJT will be smaller in the union than in the nonunion sector equation. If individuals finance a smaller proportion of OJT, it follows that they will also receive a smaller proportion of the returns from OJT. It is interesting to note that the union-induced increase in employer financing identifies a particular channel through which unions produce the decline in skill differentials.

In contrast to the expectation that unions will reduce employee returns to PRETEN and OJT, unions are expected to increase employee returns to POSTEN for the following reasons: Unions are expected to increase the probability of promotion for high tenure workers. Higher promotion probabilities in the union sector will increase the amount of advanced training provided to senior workers, because such training is required for promotion within the firm. The anticipated increase in specific training in the union sector is reinforced by the expectations that the costs of OJT will be reduced by increased hiring standards; by codified seniority in promotion provisions, which increase incumbents' willingness to train new hires by protecting their own promotion chances; and by reduced quit rates. The hypothesis that unions will increase returns to POSTEN assumes that holding the amount of OJT constant will "net out" the effect of unions to increase employer financing of OJT.

Because unions are expected to have opposing effects on the three tenure segments in the Training Model, the net effect of unions on returns to total tenure, as specified in the Experience Model, is a priori indeterminate. The negative union effects on employee returns to PRETEN and to OJT are, however, expected to dominate the positive union effects on returns to tenure following promotion. As a consequence, the coefficient of TEN in the union sector equation is expected to be smaller than in the nonunion equation.

Finally, union effects on the rate at which investment in OJT declines over time within each experience segment  $(PREV^2 \text{ and } TEN^2)$ , and the dependence of OJT investment with current employer on PREV (PREV\*TEN in the Experience Model, and PREV\*PRET and PREV\*POST in the Training Model) will be reflected by differences in these coefficients between union and nonunion sector equations. There are no a priori expectations regarding these average union effects. The hypotheses regarding union effects on returns to human capital in the two models are summarized below: Experience Model: EDu < EDn, PREVu < PREVn, TENu < TENn Training Model: EDu < EDn, PREVu < PREVn, PRETENu < PRETENn, OJTu < OJTn, POSTENu > POSTENn where the u and n subscripts refer to union and nonunion sector coefficients, respectively.

# Heterogeneity Within the Union Sector: The Effect of Differences in the Strength of Seniority in Promotion Provisions

Seniority rules codified in collective bargaining agreements are hypothesized to be the principal channel through which unions influence wage determination. If seniority rules are among the means by which unions alter wages, differences in the strength of seniority provisions across industries should produce variation in the strength of union effects. Obviously, such differences will not be captured by comparing the empirical results from union and nonunion wage equations. The model specifications developed above could generate empirical estimates which appear to confirm the hypotheses, while the route of causation on which the hypothesis development relies may not in fact be operative. In order to test the route, as well as the direction, of union effects on wage determination, the models developed above will be re-estimated for the union sector with the addition of an index which reflects the strength of seniority in promotion provisions (SENINDEX), and the interactions between SENINDEX and each human capital These SENINDEX models will examine the presence variable. and extent of heterogeneity within the union sector. These models constitute a more direct test of the proposition that the institutional effects of unionism have concrete economic consequences for wage determination.

Seniority has been defined as:

... the application of the criterion of length of service for the calculation of relative equities among employees with respect to their claims to jobs and prerogatives related to employment within the collectively determined scope of application of the criterion.<sup>85</sup>

That is, seniority is a means of measurement on which judgments in allocating employment, promotion, and other opportunities are based.

Within a single plant, the effect of seniority rules on an individual's opportunities is a function of several factors. First is the scope of application for seniority; this defines the boundaries around the collection of job opportunities in which the individual shares equity. The second factor is the location of an individual's job within the job ladder. The third factor is the amount of seniority the individual has accumulated relative to other employees in the group.

The scope of application, or seniority unit, most often used for promotions is a departmental unit. The scope and shape of departments vary across industries and across firms. Differences in production techniques are the principal source of variation in the height and breadth of seniority units across industries. These variations produce concomitant differences in skill differentiation and transferability among jobs. In contrast, the variation observed across firms within an industry is expected to result from differences in bargaining history, the relative

<sup>&</sup>lt;sup>85</sup> Meyers, "The Analytic Meaning of Seniority," p. 194.

numbers and power of interest groups within a firm's workforce, as well as management preferences and bargaining The expected variation across firms in a single stance. industry is based on studies which indicate that "Seniority is not an exact measuring rod but rather a highly flexible instrument subject to use by all groups in pursuance of their own interests."<sup>86</sup> While production technology sets limits on the breadth and height of departmental seniority units and the structure of job ladders within seniority units, a substantial degree of influence can be exerted by competing interest groups on the dimensions of a seniority unit. The rank and file correctly view seniority as a means of promoting individual and group advantage. Attempts to "gerrymander" departmental seniority units are not uncommon. In order to mitigate the effects of bumping when reductions in workforce occur, each group of workers will seek to place low-seniority groups below it on a job ladder, and will seek to bar the placement of high seniority groups directly above it.<sup>87</sup> By manipulating the placement of low-seniority groups below it, and "dead-ending" a job by having it branch off the department's main line of promotion, a work group can

<sup>&</sup>lt;sup>86</sup> Leonard R. Sayles, "Seniority: An Internal Union Problem," <u>Harvard Business</u> <u>Review</u> vol. 30 (Jan.-Feb. 1952), pp. 55-61.

<sup>&</sup>lt;sup>87</sup> This is due to the fact bumping occurs first down the line of progression in which one works, before bumping into other departments. Also, some contracts explicitly limit the areas in a plant to which one can bump. <u>Ibid</u>., p. 57.

set the boundaries of a seniority unit, the location of jobs within the unit, and the relative seniority of groups in direct competition with the work group.

The rules in collective bargaining agreements governing promotion decisions will, therefore, reflect the success of competing interest groups within a firm, as well as technologically determined interrelationships of skill content among jobs. Despite the inherent flexibility of seniority rules at the plant level, broad interindustry (1) the strength of the differences are expected in: seniority criterion for promotion decisions, (2) the scope of the seniority unit which determines the pool of workers eligible for promotion, and (3) the method of consideration individuals within the pool. of These interindustrv differences in seniority provisions should have а significant effect on the probability that an individual will receive a promotion as his or her tenure with the employer increases. The seniority index was current constructed on the basis of contract language which relates to the three types of provisions listed above, such that the larger the seniority index of an industry, the higher the probability that a senior worker in that industry will receive a promotion.88

<sup>&</sup>lt;sup>88</sup> See the Data section in this chapter for a detailed description of how the seniority index was constructed.

There is an important, albeit subtle, difference between the effect of seniority in promotion provisions on returns to tenure within the union sector and the average union/nonunion differences in employee returns to tenure. The expectation that seniority rules tie the probability of promotion to length of service, as well as increasing the length of worker attachment to the current employer, implies that, over the tenure segment, more union sector workers will receive a promotion than comparable nonunion sector workers. While the wage increment required to induce the desired internal mobility patterns may vary between union and nonunion sectors, there remains a clear association between the receipt of promotion and wage increases. Hence, there is the expectation that returns to POSTEN will be greater in the union than in the nonunion sector. In other words, when comparing the effect of enforceable seniority rights with no enforceable rights, contractual seniority provisions are expected to tie promotion to length of service. Greater promotion probabilities are expected to increase wages as tenure on the subsequent job increases.

Within the union sector, it is no longer only a question of whether promotion is tied to length of service, but also a question of the size of the wage increment which results from promotion. In essence, the within- union sector analysis holds constant much of the variation in the probability of promotion associated with tenure. As a

result, considerations peripheral to generating hypotheses concerning union/nonunion differences become central for hypotheses concerning the effect of seniority provisions within the union sector.

The strongest method of consideration for choosing among individuals within the relevant seniority district is "automatic consideration." Under a provision which specifies automatic consideration, the most senior employee in the job below the vacancy in a promotion ladder is automatically promoted. If it is assumed that smaller wage increments are required to induce the desired mobility when the promotion decision is more automatic, then there should be a negative association between the strength of seniority provisions and employee returns to tenure. That expectation is reinforced by the possibility that better working conditions, more overtime opportunities, or other favorable job attributes, not reflected in the base wage rate, may associated with promotion. also be The preceding expectation implies that TEN\*SEN will have a negative effect on wages in the Experience Model. This expectation implies that PRET\*SEN and POST\*SEN will have negative effects on wages in the Training Model.

An equally important difference between average union effects, and the effect of the strength of seniority provisions within the union sector, concerns expected shifts in the timing of OJT provision. These shifts are expected to

result from the asymmetrical effects of seniority on promotions and layoffs. Union sector hiring standards are expected to increase beyond those in the nonunion sector, due to the union wage effect and seniority in promotion provisions. Increased hiring standards, in turn, are expected to reduce the amount of general OJT provided on the initial job. Conversely, seniority rules are expected to increase the amount of specific OJT which is received on subsequent jobs, as a result of the increased probability of promotion within the union sector. The anticipated deferral of large specific training investments until an individual has sufficient seniority to be promoted should be reflected in the coefficients of TEN<sup>2</sup>\*SEN and PREV\*TEN\*SEN in the Experience Model, and PREV\*PRET and PREV\*POST in the Training Model.

More precisely, specific OJT will be received later in the tenure segment if the union-induced increase in specific training occurs when senior workers are promoted. The stronger the seniority in promotion provisions, the stronger will be the deferral of the provision of OJT. Thus, TEN<sup>2</sup>\*SEN is expected to have a positive effect on wages.

Although a negative dependence of OJT on PREV is expected in the union, as well as the nonunion sector, this dependence should be reduced by the strength of seniority provisions. Unionized employers are expected to raise hiring standards because strong seniority rules constrain an

employer's ability to promote individuals having less seniority than others in a job ladder. Since seniority and age are positively correlated, use of seniority for promotion implies that union sector workers will be older than nonunion sector workers when promoted, ceteris paribus. Further, the expected negative dependence of OJT on PREV derives from the positive correlation between age and PREV. Thus, where the seniority in promotion provisions are stronger, the negative dependence of OJT on PREV should be reduced. For the Experience Model, the reduced dependence of OJT on PREV implies that the coefficient of PREV\*TEN\*SEN will be positive. In the Training Model, the reduced dependence of OJT on PREV implies that PREV\*PRET\*SEN and PREV\*POST\*SEN will have positive effects on wages. These expectations are reinforced by the expectation that unions increase the amount of specific training provided, since specific training is expected to depend positively on PREV.

The SENINDEX is also expected to reflect precisely those forces which generate and insulate internal labor markets from external labor market forces.<sup>99</sup> Thus, the stronger the strength of seniority in promotion provisions, the greater the dampening effect of collective bargaining coverage on returns to externally acquired human capital. That is, ED\*SEN and PREV\*SEN are expected to have a negative

<sup>&</sup>lt;sup>8</sup><sup>9</sup> See the discussion in Chapter III concerning the choice of internal labor markets as the unit of analysis, for an explicit discussion of how unions contribute to the generation of internal labor markets.

effect on wages. Although OJT, as measured by the data, is acquired internally, seniority rules are expected to reduce labor turnover. Lower turnover rates increase employers' incentives to finance OJT. Therefore, the average union effect of altering employer and employee shares of OJT financing should be a positive function of the strength of seniority provisions. OJT\*SEN is consequently expected to have a negative effect on wages.

#### Control Variables

The focus of interest in this dissertation is on the variables discussed above. A vector of control variables is included in order to avoid misspecification of the model through omission of variables which have independent effects on wages, and which are correlated with the variables of theoretical interest. One group of control variables consists of job and residence characteristics which are known to have an impact on wages. This group of variables includes the following: (1) A variable indicating full-time work (FT) is included, as it may be a signal to employers of labor force attachment, and thus influence the amount of OJT received.<sup>90</sup> (2)The presence of a large metropolitan area in the primary sampling unit in which the individual resides

<sup>&</sup>lt;sup>91</sup> Although it can be argued that full-time work is endogenous to unionism, it must either be controlled for, or individuals who work part-time must be dropped from the sample. Since there are individuals in the sample who work part-time and whose wages are set by a collective bargaining agreement, it was decided to keep them in the sample and control for the hours worked.

(SMSA) will influence wages, since it indicates high area wage levels relative to rural areas, and higher educational attainment of the local labor supply. (3) Census region of residence (REGN) is included to control for differences in regional wage levels, cost of living, and the density of union organization. (4) Variables indicating one- or two-digit industry of employment, and (5) one-digit occupation, are included to control for expected differences across industries and occupations in production techniques, the density of union organization, job structure, and the relative importance of general and specific on-the-job training.

Two alternative sets of variables were utilized to control for differences in labor supply among individuals and race/sex groups. The first set consists of direct measures of prior work history. These measures include the number of years between school completion and the first job (EDTOLFP), the number of years out of the labor force after the first job (YRSOLF), and the number of years worked full-time, in percent of total years worked (PCTFT).<sup>91</sup> Controls for prior work history should be particularly

<sup>&</sup>lt;sup>91</sup> These control variables for labor supply omit a measure of marital status. The decision to omit a variable for marital status was made because, although marital status has been found to influence wages, it is not entirely clear why this should be the case. Since direct measures of those variables which marital status affects that should also influence productivity are included, it was not deemed necessary to include indicators of marital status per se.

important in estimating women's wages. Human capital theorists attribute sex-based differences in returns to work experience to rational individual decisions to defer investment in OJT in anticipation of intermittent labor force participation. Since OJT received on previous jobs is not observed in the data used, it is necessary to control for such differential labor force attachment. Also, since unions are expected to increase the employer's share of OJT financing, union sector employers may screen applicants on the basis of actual or perceived labor force attachment. Thus, these work history measures of EDTOLFP, YRSOLF, and PCTFT, should capture otherwise unmeasured sources of wage differentials. The two measures of work interruption, EDTOLFP and YRSOLF, are expected to have a negative effect on wages, and the percentage of prior work history which was full-time, PCTFT, should increase wages through the hypothesized effects of these work history variables on prior investment in OJT.

It can be argued that the proper specification of a model which includes measures of time out of the labor force also requires that each work interruption measure be interacted with PREV and PREV<sup>2</sup> (and TEN and TEN<sup>2</sup> in the Experience Model), because prior work history influences the stock, mix, and rate of investment in OJT, in both the present and the past. Given the SENINDEX-human capital interactions which are a principal focus of interest in this

dissertation, the above procedure would require third-order interaction terms. Sample size limitations prohibit such an expansion of the model.

A consequence of including the work history variables will be to change the interpretation of the education coefficient. Since education proxies for taste for market work and foregone income from dropping out of the labor force, labor force attachment is a positive function of educational level. The inclusion of work interruption measures will "net out" the indirect effect of education on wages through the influence of education on labor supply decisions.

An alternative specification used to control for differences in labor supply is a reduced-form wage equation which includes the determinants of an individual's labor supply. These variables include the following: (1)Nonlabor income (NONLABINC), (2)Spouse's labor income (SPLABINC), (3)The number of children under six years of age (CHILD), and (4)The unemployment rate in the individual's county of residence (UE1 to UE5).

NONLABINC includes all nonlabor income and wealth of a household consisting of: the asset part of income from farm, unincorporated business, and room and board; income from rent, interest and dividends; and income from all transfer payments to the household. SPLABINC measures the spouse's actual earned income. Both of these measures are

intended to capture the income effect on labor force participation: an individual with greater unearned income will, other things being equal, choose to work less, and will consequently exhibit a higher reservation wage. If this same individual is working, and faces an identical distribution of market wage offers as do those persons with less other family income, she or he is likely to have obtained a higher wage than a person who has less other income, but has the same expected market wage based on individual characteristics alone. Consequently, the individual's nonlabor and spouse's labor income are expected to have positive influences on wages.

This specification of a reduced-form wage equation uses observed earnings for estimation, rather than the imputed wage rate of the spouse. The spouse's wage was not imputed for this study. That would have required separate wage equations for presently married and for other individuals. Since a large proportion of the sample of women are single heads of household, limitations of sample size prohibited the use of imputed wages.

Another control variable which is included as a determinant of labor supply is the number of children under six years of age (CHILD) in the household. For women, this variable should proxy for home productivity or the shadow value of home production to the household. Hence, CHILD is expected to induce a higher reservation wage. Women with
small children who work outside the home are expected to obtain a higher wage than what would be predicted on the basis of their individual characteristics alone.

A series of binary variables was also included to indicate the unemployment rate in the county of the individual's residence (UE1 to UE5). UE1 equals one for counties with the lowest reported unemployment rates, UE2 equals one for counties with the next lowest unemployment rates, and so on. The omitted reference category refers to an individual's residence in a county with an unemployment rate greater than 10 percent. These variables are intended to capture the general job prospects which an individual faces, since these prospects are expected to influence labor force participation decisions. Studies indicate that flow rates out of the labor force increase as the rate of unemployment increases. This labor force flow, which occurs for all demographic groups, results from the higher probability of individuals dropping out of the labor force when unemployed. When unemployment rates are high, more people are subject to discouragement. Thus, the lower the unemployment rate, the greater the probability of being employed.

The net effect of area unemployment rates on an individual's wage is, a priori, indeterminate. On one hand, the lower the unemployment rate, the less downward wage pressure there will be, and the less likelihood that an

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individual will accept a wage lower than desired. This expectation is supported by findings that reservation wages tend to decline as the duration of unemployment increases.<sup>92</sup> In the absence of downward pressure on wages, and in the presence of available employment alternatives, a negative relationship would be expected between the county unemployment rate and wages. On the other hand, the equilibrium model relating wages and unemployment rates which was first discussed by Adam Smith, 93 and was formalized and tested by Reza, 94 support the existence of a positive relationship between wages and unemployment rates. Workers reach equilibrium when the expected value of the hourly wage in areas of high unemployment is equal to the expected value of the hourly wage received in areas of low unemployment. Since the probability of finding a job is lower in areas of high unemployment than in areas of low unemployment, the average wage across areas must be a positive function of unemployment rates in order to equate the expected value of wages across areas.

- <sup>93</sup> Adam Smith, <u>The Wealth of Nations</u>, ed. Edwin Cannan (New York: Random House, 1937), pp. 86-87.
- <sup>94</sup> Ali M. Reza, "Geographical Differences in Earnings and Unemployment," <u>Review of Economics and Statistics</u> (May, 1978): pp. 201-202.

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<sup>&</sup>lt;sup>92</sup> See, for example, Nicholas M. Keifer and George R. Neumann, "An Empirical Job-Search Model, with a Test of the Constant Reservation -Wage Hypothesis," <u>Journal of</u> <u>Political Economy</u>, vol. 8, no.1 (Feb. 1979)

Similarly, employers reach equilibrium when unit labor costs are equal between areas. Areas of high unemployment have lower turnover rates than do low unemployment areas. Low turnover rates reduce recruitment and training costs, reduce labor hoarding within firms. and Because "productivity" in high unemployment areas will exceed "productivity" in low unemployment areas, employers in high unemployment areas can pay a higher wage than employers in low unemployment areas. Based on the equilibrium model discussed above, a positive relationship would be expected between wages and county unemployment rates.

Table 4-1 summarizes all the variables to be used, their definitions, and expected effects on wages.

### The Data

### Information on Individuals

The principal source of data utilized in the analyses is the 1976 wave of A Panel Study of Income Dynamics, produced at the Survey Research Center of the University of Michigan. All the variables discussed above, with the exception of the seniority in promotion index, are available or can be constructed from the data tapes available to the investigator. They have been acquired by Michigan State University through the University Data Consortium. As implied throughout the discussion, the unit of analysis is the individual worker.

## Table 4-1

# Variable Names, Definitions, and Hypothesized Effects on Wages

| Variable<br>Name  | Definition                                                                                                                         | Expected<br>Sign |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------|
| lnW               | The natural logarithm <sup>1</sup> of the hourly<br>wage rate (the dependent variable)                                             |                  |
| ED                | Highest grade completed, in years                                                                                                  | +                |
| PREV              | The number of years of work<br>experience, prior to present employer                                                               | +                |
| TEN               | The total number of months worked for present employer, in year equivalents                                                        | +                |
| PREV*TEN          | An interaction term <sup>2</sup> between previous<br>experience and tenure with present<br>employer                                | -                |
| PREV <sup>2</sup> | Years of previus work experience squa                                                                                              | red -            |
| TEN <sup>2</sup>  | Months (in year equivalents) worked<br>for present employer squared                                                                | -                |
| PRETEN            | Months worked for present employer print<br>to present position, in year equivale                                                  | ior +<br>nts     |
| OJT               | The number of months required for the<br>"average person to become fully train<br>and qualified on a job like yours"               | +<br>ed          |
| POSTEN            | The number of months in present posit<br>after OJT completed, in year equivale                                                     | ion +<br>nts     |
| PREV*PRET         | An interaction term <sup>2</sup> between previous with present employer                                                            | -                |
| PREV*POST         | An interaction term <sup>2</sup> between previous<br>experience and time in job following<br>internal mobility with present employ | -<br>er          |
| UNION             | Equals 1 if current job is covered by<br>a collective bargaining agreement, ze<br>otherwise                                        | +<br>ro          |

Table 4-1 (cont'd.)

| Variable<br>Name | Definition                                                                                                                                                                                | Expected<br>Sign |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| FT               | Equals 1 if the individual worked full-time in 1976, 0 otherwise                                                                                                                          | +                |
| SMSA             | Equals 1 if the individual resided in<br>a primary sampling unit containing an<br>SMSA in 1976, 0 otherwise                                                                               | +                |
| REGN             | A vector of dummy variables denoting<br>Census region of residence in 1976<br>(omitted reference category South)                                                                          |                  |
| INDUS            | A vector of binary variables represent<br>the industry of employment in 1976<br>(omitted reference category nondurable<br>manufacturing)                                                  | ing              |
| occ              | A vector of binary variables represent<br>one-digit occupation of employment in<br>1976 (omitted reference category<br>operatives                                                         | ing              |
| EDTOLFP          | The number of years between school completion and first job                                                                                                                               | -                |
| YRSOLF           | The number of years out of the labor<br>force between first job and 1976                                                                                                                  | -                |
| PCTFT            | The number of years worked full-time<br>in percent                                                                                                                                        | +                |
| NONLABINC        | Nonlabor income: asset part of<br>income from farm, unincorporated<br>business, and room and board; income<br>from rent, interest and dividends; and<br>income from all transfer payments | +                |
| SPINC            | Spouse's earned income                                                                                                                                                                    | +                |
| CHILD            | The number of children under six<br>years of age                                                                                                                                          | +                |
| UE1 - UE5        | The unemployment rate in the<br>individual's county of residence<br>in 1976 (omitted reference category:<br>unemployment greater than 10%)                                                | ?                |

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| Variable<br>Name Definition                        |                                                                                                                                       | Expected<br>Sign |  |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------|--|
|                                                    | AVERAGE UNION/NONUNION DIFFERENCES                                                                                                    |                  |  |
| EDu <edn< td=""><td></td><td></td></edn<>          |                                                                                                                                       |                  |  |
| PREVu <prevn< td=""><td></td><td></td></prevn<>    |                                                                                                                                       |                  |  |
| TENu <tenn< td=""><td></td><td></td></tenn<>       |                                                                                                                                       |                  |  |
| PRETENu <pret< td=""><td>ENn</td><td></td></pret<> | ENn                                                                                                                                   |                  |  |
| OJTu <ojtn< td=""><td></td><td></td></ojtn<>       |                                                                                                                                       |                  |  |
| POSTENu>POST                                       | ENn                                                                                                                                   |                  |  |
| THE EI                                             | FFECT OF SENIORITY IN PROMOTION PROVISI                                                                                               | ONS              |  |
| ED*SEN                                             |                                                                                                                                       | -                |  |
| PREV*SEN                                           |                                                                                                                                       | -                |  |
| PREV <sup>2</sup> *SEN                             | Interaction terms <sup>2</sup> between these                                                                                          | ?                |  |
| TEN*SEN                                            | measures of human capital and the                                                                                                     | -                |  |
| TEN <sup>2</sup> * SEN                             | strength of seniority provisions                                                                                                      | +                |  |
| PR*TEN*SEN                                         | index for those covered by a                                                                                                          | +                |  |
| PRET*SEN                                           | collective bargaining agreement                                                                                                       | -                |  |
| OJT*SEN                                            |                                                                                                                                       | -                |  |
| POST*SEN                                           |                                                                                                                                       | -                |  |
| PREV*PRET*SE                                       | N                                                                                                                                     | +                |  |
| PREV*POST*SE                                       | N                                                                                                                                     | +                |  |
| <sup>1</sup> The w<br>that e<br>variab<br>effect   | age rate is transformed into logs so<br>stimated coefficients of the independe<br>les can be interpreted as percentage<br>s on wages. | nt               |  |

<sup>2</sup> The interaction terms are created by multiplying the components together.

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A further note on the OJT variable is in order. The measure of OJT was obtained in response to the question: "On a job like yours, how long would it take the average new person to become fully trained and qualified?" Since this question followed a series of questions about the formal education and special training requirements of the present job, the response to this question should not capture alternative types of training requirements. The wording of the question included "the average new person," in order to tailor the response to the job itself, rather than to any particular attributes of the respondent. The OJT variable differs from the precise human capital concept of OJT as the fraction of potential working time devoted to training. Also, the OJT variable does not reflect the varying time-intensities which are possible between two jobs with equal lengths of OJT.95

Coverage by a collective bargaining agreement was used to differentiate between union and nonunion sector employment. Almost all other empirical investigations of union effects on wages have used union membership. Although both measures were available from the PSID, collective bargaining coverage was chosen for the reasons which follow.

<sup>&</sup>lt;sup>95</sup> Duncan and Hoffman, "On-the-Job Training and Earnings," p. 597. The distribution of the average response to this question across major occupational groups conforms with a priori expectations. The overall average was 1.66 years of OJT; professional-technical and managers average was almost three years; clericals less than a year; crafts, police and fire over two years; operatives and laborers 1/2 to 3/4 year.

While almost all union members are also covered by a collective bargaining agreement, the converse is not always true. The question then, is whether union membeship per se, or the process by which terms and conditions of employment are set, should be utilized here to test the hypotheses developed above. The institutional channel through which unions are expected to influence wage determination is the collective bargaining agreement, and in particular the seniority provisions in the agreement. It is, therefore, most appropriate to utilize collective bargaining coverage as a means of differentiating between union and nonunion employment.

Another reason for using collective bargaining coverage is that unions have a legal duty to represent all persons in the bargaining unit, regardless of union membership. It would be exceedingly difficult for the union to differentiate between members and nonmembers when negotiating an agreement, even if it chose to violate the law. Management would have to agree to such differentiation during negotiations, and it is not expected that such agreement would be obtained. Therefore, bargaining unit members should receive the same benefits from unionization, regardless of membership. expectation that The all bargaining unit members will benefit equally from coverage reflects the "public goods" aspect of unionization, which

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other researchers have discussed.<sup>96</sup> Conversely, union members whose wages are not set by a collective bargaining agreement would not be subject to union influence which occurs through the codification of seniority provisions. Because seniority rules are the particular channel of union influence which will be tested empirically, collective bargaining coverage was the chosen measure.

Differences in estimated union wage effects between covered union members and covered nonmembers were examined in a recent study by Jones.<sup>97</sup> She found that the fraction of nonmembership among covered workers ranges from 25.0 percent for white women to 4.9 percent for black men. The author also reports that the union/nonunion wage differential estimated for covered members exceeds the differential estimated for covered nonmembers. The difference in estimated union wage differentials appears to be the result (1)misclassification for of: some nonmembers who incorrectly report that they are covered by a union agreement, (2) the concentration of covered nonmembers in white collar and government employment where union wage differentials are relatively small, and (3) the probationary period included in most collective bargaining agreements. These three sources of the difference in union wage

<sup>&</sup>lt;sup>96</sup> See, for example, Duncan and Stafford, "Do Union Members Receive Compensating Differentials."

<sup>&</sup>lt;sup>97</sup> Ethel B. Jones, "Union/Nonunion Wage Differentials: Membership or Coverage?," <u>Journal of Human Resources</u> 17 (Spring 1982): 276-285.

estimates between membership and coverage fail to fully account for the differences in estimated union wage effects.

The choice of coverage versus membership apparently entails an unavoidable choice of measurement error. If union membership is used, individuals who are actually covered by an agreement will be treated as nonunion, and the institutional sources of union influence on their wages will be ignored. If collective bargaining coverage is used, the response error among nonmembers who incorrectly report coverage will be a source of statistical bias of undeterminable magnitude.

The dependent variable used for all analyses is the natural log of the hourly wage rate (lnW). Observed wages were transformed into natural logs, so that each estimated coefficient can be interpreted as the percentage change in the wage resulting from a unit change in each independent variable. Note that use of the straight-time hourly wage will not capture the effect of differential overtime opportunities which may be associated with promotion. The hourly wage was used, despite the preceding caveat, in order to abstract from the effect of hours worked, which is unrelated to employee returns to human capital investments.

Strength of Seniority in Promotion Index

The seniority index (SENINDEX) was constructed from information obtained by the Bureau of Labor Statistics' survey, Characteristics of Major Collective Bargaining

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Agreements. The machine-readable data file covers contracts in effect in 1967 and 1968. The use of a seniority index derived from collective bargaining agreements in 1967 and 1968 to predict wages in 1976 assumes that the rankings of industries according to the strength of seniority in promotion provisions did not change over that ten year interval. The acceptability of such an assumption is based on the following considerations: 98 Since the agreements sampled by the BLS cover 1,000 workers or more, they may be considered stable collective bargaining relationships which are no longer subject to major modifications in basic non-wage conditions of employment. As the brief historical analysis of seniority in promotion contained in Chapter III suggests, the seniority principle was generally accepted by both labor and management during World War II and the early It is, therefore, unlikely that post-War vears. sufficiently large changes in these provisions have occurred over the ten year period to bias the statistical results.

Three types of contract provisions governing seniority in promotion were evaluated to construct the SENINDEX. These provisions were: the role of seniority in promotion, the method of consideration for promotion, and the seniority unit specified for promotion. Each provision was assigned a

<sup>&</sup>lt;sup>98</sup> The assumptions and decision rules used to construct the seniority index were first developed by Thomas A. Kochan and Richard N. Block, "An Interindustry Analysis of Bargaining Outcomes: Preliminary Evidence from Two-Digit Industries," <u>The Quarterly Journal of Economics</u>, vol 91, No. 3 (August 1977): 431-452.

score between 0.00 and 10.00. The language contained in the three promotion provisions was evaluated on the basis of a priori expectations such that the stronger the contract provision, the greater would be an individual's probability of receiving a promotion as his or her tenure with the current employer tenure increased.<sup>99</sup>

Contract language used in the role of seniority in promotion provisions was evaluated as follows: Provisions which specified seniority as the sole criterion in promotion decisions were assigned a value of 10.00. Provisions which specified senority as the primary consideration, subject only to physical ability to do the work, was ranked next, followed bv seniority as primary, but subject to non-seniority factors other physical fitness. than Seniority constrained only by physical ability, relative to other possible non-seniority factors, was deemed a very minimal restriction on the pure seniority criterion and was given greater weight than the other non-seniority factors. Provisions which specified seniority as equally weighted with factors other than physical ability were similarly evaluated. Thus, clauses which specified equal weight for seniority and physical ability were weighted more heavily than those which specified that seniority be given equal weight with other non-seniority factors. An identical decision rule was used to evaluate provisions which

<sup>&</sup>lt;sup>99</sup> The BLS defines a promotion as movement to a higher paid or more responsible job.

specified seniority as a secondary consideration with physical ability and other non-seniority factors. The absence of a promotion provision was evaluated more highly than a provision which did not indicate seniority as a factor in the promotion decision. This decision was made under the assumption that, if a grievance over a promotion decision were filed, and the contract did not contain a provision on the role of seniority, an arbitrator would have greater latitude to rule in favor of the most senior employee than if a provision existed which implicitly gave seniority no weight. Table 4-2 contains information on contract language which specifies the role of seniority in promotion and their assigned values.

The weighting of various types of contract language for the method of consideration in promotion provisions is shown in Table 4-3. Employees may be selected for promotion in a variety of ways. Contract language which gives management the least discretion ( $\underline{i}.\underline{e}.$ , automatic consideration or progression) was assigned a value of 10.00, while language which gives management total discretion was assigned a value of 0.00. This weighting scheme assumes that the more constrained management discretion is, the more important the seniority criterion for promotion will be. This assumption is based on the observation that management often favors the use of ability, or criteria other than seniority, for promotion decisions. Automatic consideration or progression indicates that eligibility for promotion is restricted to employees in the specific line of progression and, furthermore, that the most senior incumbent immediately below the vacancy in that job ladder is promoted automatically. Automatic consideration represents the "ideal type" on which internal labor market theory is based.

which Contract provisions mention automatic consideration in combination with other methods of consideration were assigned the next highest values, followed by job posting and bidding alone; then job posting and bidding in combination with employee request alone; then employee request. Contracts which specified job posting and bidding usually require that the employer select the person to be promoted from the pool of employees who bid for the opening, but presumably, constrain management discretion in the choice of the promotee to a lesser degree than does automatic consideration. As in the construction of the role of seniority sub-index, and by similar reasoning, the absence of a promotion provision was evaluated more highly than the presence of a provision which failed to specify a method of consideration.

The final contract provision sub-index pertains to the seniority unit specified for promotion. Evaluation of contract language for this clause was based on the relationships among skill level, skill content and specialization, on-the-job training, and the horizontal and

#### Table 4-2

The Role of Seniority in Promotion

| Contract Language                                                             | Value |
|-------------------------------------------------------------------------------|-------|
| Seniority sole consideration                                                  | 10.00 |
| Seniority primary, subject to physical fitness <sup>1</sup>                   | 8.89  |
| Seniority primary, subject to<br>other non-seniority factors                  | 7.78  |
| Seniority and physical fitness given equal weight                             | 6.67  |
| Seniority and other non-seniority<br>factors given equal weight <sup>2</sup>  | 5.55  |
| Seniority secondary to physical fitness <sup>1</sup>                          | 4.44  |
| Seniority secondary to other non-seniority factors                            | 3.33  |
| Other                                                                         | 2.22  |
| No promotion provision                                                        | 1.11  |
| Contains promotion provision, and<br>no indication that seniority is a factor | 0.00  |

<sup>1</sup> Physical fitness includes age as a criterion.

<sup>2</sup> Provisions which mention both seniority and factors, but did not explicity assign relative weights among them, are included in this category. This assumes that in the absence of explicit weights, seniority and other factors are weighted relatively equally.

### Table 4-3

The Method of Consideration for Promotion

| Contract Language                                                           | Value |
|-----------------------------------------------------------------------------|-------|
| Automatic consideration or progression                                      | 10.00 |
| Combination: (1)automatic consideration<br>(2)employee request              | 8.89  |
| Combination: (1)job posting and bidding,<br>(2)automatic consideration.     | 7.78  |
| Job posting and bidding                                                     | 6.67  |
| Combination: (1)job posting and bidding<br>(2)employee request              | 5.56  |
| Employee request                                                            | 4.45  |
| Unclear or other                                                            | 3.33  |
| No promotion provision                                                      | 2.22  |
| No provision for method of consideration                                    | 1.11  |
| <b>Company</b> discretion only, or in combination<br>with employee request. | 0.00  |

vertical dimensions of internal mobility districts which have been analyzed by internal labor market theorists. In groups of jobs which are low in skill content, and for which the skills are similar or overlapping, there is a high probability that broad departmental or plant-wide senority districts will be specified for internal movement. Conversely, in jobs which require relatively high skill levels, and in which the skill relationships within one job group are greater than the skill relationships between that job group and otherjob groups, a narrower senority district, with a well-defined promotion ladder, is expected. That expectation is due to the efficiencies and importance of OJT provision in the high skill level groups; efficiencies which are not available in job groups with low skills, or with little differentiation of skill among jobs within a group.

The process of designing jobs and of determining hiring and internal mobility patterns provides one of the primary mechanisms by which the costs of training and internal retraining entry are controlled within the plant. ... When specific progression ladders defining precise interjob mobility linkages are established, there is typically a logical relationship between the job progression pattern and the process of incremental skill development through on-the-job training.<sup>100</sup>

In the horizontal dimension, then, greater skill content of jobs is associated with narrower districts for promotion. Additionally, an inverse relationship is expected between the breadth of the district and the height of the job

<sup>&</sup>lt;sup>100</sup> Doeringer, "Determinants of the Structure of Industrial Type Internal Labor Markets," pp. 213-214.

ladder. The relationship between the breadth and height of a job ladder is expected to influence the opportunity for promotion.

A prime ingredient of the process which allows for upgrading is that it be fairly rigidly separated into skill groups. ... Ironically the greater the skill transferability of one job for another and the greater capability the employee has to move to another section of the operation, the less is his upgrading opportunity.<sup>101</sup>

Therefore, other things being equal, individuals in jobs which are part of a narrow mobility district are expected to enjoy a greater probability of promotion than are individuals in broad mobility districts. The weighting of contract language for the seniority unit specified in Table 4-4 is based on this hypothesis.

As previously discussed, the wage increment required in the union sector to induce the desired mobility is expected to be smaller when the promotion decision is more automatic. The strength of the association between the method of consideration for promotion, and the size of the wage increment received by the promotee is, however, expected to vary with several factors. The shape of the seniority district for promotion should influence the size of the wage differential required to induce the desired mobility by affecting the number of candidates for a job. Using polar cases for purposes of illustration, the wage differential

<sup>&</sup>lt;sup>101</sup> William J. Grinker, Donald Cooke, and Arthur Kisch, <u>Climbing the Job Ladder: A Study of Employee</u> <u>Advancement in Eleven Industries</u> (New York: E.F. Shelley and Co., 1970), p. 12.

## Table 4-4

# The Seniority Unit Specified for Promotion

| Contract Language                                              | Value |
|----------------------------------------------------------------|-------|
| Job or occupational classification                             | 10.00 |
| Combination: (l)job, and (2)subdivision,<br>plant or other     | 8.75  |
| Combination: Job, subdivision and plant,<br>no specified order | 7.50  |
| Subdivision                                                    | 6.25  |
| <b>Combination:</b> (1)subdivision, (2)plant or other          | 5.00  |
| Plant                                                          | 3.75  |
| Subject to local negotiation, or with subdivision secondary    | 2.50  |
| Other, unclear, or no promotion provision                      | 1.25  |
| Unit not specified in promotion provision                      | 0.00  |

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required to induce mobility in districts which are one job wide will depend on the preferences of the incumbent in the Since large variations in the internal wage iob below. substantial difficulties could create structure in maintaining wage relationships among jobs within the same promotional sequence, and within the same job level in different sequences, management is expected to set a sufficiently large wage differential to be consistent with most individual preferences. In contrast, for job ladders of the pyramidal type (in which there are a large number of candidates relative to the number of vacancies), inducing the desired mobility will be constrained only by the preference of the single individual who most desires the promotion.<sup>102</sup> In sum, the broader the seniority district, the narrower the wage differentials between sequential jobs, and consequently, the flatter the wage-tenure profile is expected to be. Broad seniority districts within the union sector reduce the probability of promotion irrespective of tenure, but increase the wage increment which is associated with promotion relative to narrow seniority districts.<sup>103</sup>

<sup>102</sup> Doeringer and Piore, <u>Internal Labor Markets</u>, p. 81.

<sup>103</sup> The relationship between wage increments and receipt of promotion will also vary in strength depending on whether upward mobility is mandatory or voluntary. Wage differentials would have to be larger, <u>cet. par.</u>, under voluntary (e.g. posting and bidding) procedures than under mandatory procedures. However, since: (1)mandatory schemes are relatively rare in production jobs, and (2)there would be a negative effect on employee morale under a mandatory promotion scheme if the movement was not viewed as desirable, this caveat is

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The expected negative association between wage growth with tenure and automatic consideration for promotion is bolstered by the existence of compensating differentials such as: more pleasant working conditions, less physically demanding tasks, or greater overtime opportunities. Several references in the institutional literature suggest that, as a result of overtime opportunities, lower-rated jobs can produce higher incomes than higher-rated jobs in a given promotion sequence. The existence of compensating differentials will not be captured in the hourly wage rate, which is used as the dependent variable in the analyses.

There is a strong empirical relationship between the method of consideration for promotion and the unit specified for promotion. Among agreements which specified automatic consideration as the single method of promotion, more than half of these agreements specified a job or occupational classification as the seniority unit. By contrast, of those agreements which specified posting and bidding as the method of consideration, almost half specified the subdivision of the plant as the seniority unit, and nearly as many specified the entire plant as the unit. The relationship between the method of consideration and the seniority unit results from the difficulty of using automatic consideration for broad seniority districts. Lines of progression are either absent in plant-wide units, or are defined for

not expected to be of substantial practical significance.

purposes other than to capture the natural skill development process. The posting and bidding procedure is appropriate for larger units, as a means of reducing the size of the pool of eligible employees from which to draw one employee to fill a single vacancy. The empirical relationship between the method of consideration and the seniority unit is consistent with the hypothesis that the probability of promotion decreases as the scope of the seniority unit increases. In narrow districts, the promotion decision is based largely on an individual's incumbency in the line of progression. Consequently, there will be less competition for a given vacancy.

Once the provisions in each contract were coded to reflect the values discussed above, the index was constructed as follows: First, the three provision values for the role of seniority, the method of consideration, and the seniority unit, were summed to create a seniority index agreement.<sup>104</sup> Expressed mathematically, for each the computation performed was:

(1)  $Sj = \Sigma Vij$ 

<sup>&</sup>lt;sup>104</sup> The underlying assumption of this simple summation of provision values is that they are all of equal weight. Because there are no a priori expectations that any one provision is more important than any other, this followed. procedure was In addition, the three provisions are expected to be very highly correlated, as in the case of method of consideration and seniority Therefore, any other weighting scheme would be unit. unlikely to produce different rankings.

where: Sj = the SENINDEX for agreement j, and Vij = the value of the ith provision in the jth agreement. A SENINDEX was then constructed for each two-digit industry. This was accomplished by weighting the seniority index for each agreement by the number of workers covered by that agreement. The weighted SENINDEXes were then summed over all agreements sampled in an industry. This sum was then divided by the total number of workers covered by all agreements sampled in each industry. This procedure can be expressed as follows:

where: Sk = the seniority index for two-digit industry k; Sj = the seniority index for agreement j; Wjk = the number of workers covered by agreement j in industry k; Wk = the total number of workers covered by the agreements in the sample in industry k.

The seniority index for each agreement was weighted by the number of workers covered. This was done to avoid the possibility of biasing the industry average, as a result of extreme index scores for agreements covering a relatively small number of workers. The industry seniority indexes had a potential range between 0.00° and 30.00. There were individual agreements with scores at both extremes. Index averages at the three-digit industry level also exhibited substantial variation. However, the averaging procedure used to obtain one- or two-digit industry indexes reduced the range substantially, to between 3.48 and 21.12. Although it would have been advantageous to retain the maximum amount of variation for multiple regression analysis, it was not possible to use the index at the three-digit industry level. The BLS maintains that this information is unreliable at the three-digit industry level. The sample of agreements is from large firms. Some of the firms produce in more than one three-digit industry, but have only one collective bargaining agreement. Also, the number of agreements in some three-digit industries is insufficient to develop an accurate measure of the strength of seniority in promotion provisions. Finally, the industry information which was used to assign a SENINDEX to each individual was available at the one- or two-digit industry Each individual covered by a collective level only. bargaining agreement was assigned a SENINDEX equal to the average SENINDEX value of the industry in which he or she was currently employed.

As a result of the necessity to average the SENINDEX to the one- or two-digit industry level, the seniority index is expected to be a blunt measure of the effect of seniority in promotion provisions. Despite this caveat, the seniority index should still provide substantially more information on the route of union influence on wage determination than the simple binary union variable. Since the reduced variation in SENINDEX should militate against finding a statistically significant effect, the effect of SENINDEX on employee returns to human capital will be subjected to a strong test.

### Methodology

The wage equations will be estimated by means of Ordinary Least Squares.<sup>105</sup> Separate equations will be estimated for union and nonunion sectors. In order to determine the statistical significance of the difference between union and nonunion employment in human capital coefficients, the union status groups will be pooled. All independent variables will be interacted with the UNION variable, and then linear restrictions will be placed on all union interaction coefficients, and on all the union-human

105 A number of recent union wage studies have noted that the wages observed for the union and nonunion workers are not random samples from the wage distribution of the entire population, because the decision whether to take a unionized job depends on the anticipated wage differential compared with their best nonunion alternatives. In this circumstance, estimates using OLS and observed wages would be inconsistent, and would require a statistical technique which corrects for sample selectivity. While this problem should lead to biased estimates of the union-nonunion wage differential (the "lump-sum" effect discussed in the text) using OLS, there is no reason to believe a priori that it will bias estimates of marginal returns to human capital investments--the principal focus of the present study. Rather, the selectivity is in part a response to the differing wage structures between union and nonunion sectors. A study which investigates this question by re-estimating Bloch and Kuskin's study confirms these That is, the "lump-sum" union wage expectations. differential is underestimated by OLS, but estimated marginal returns to human capital remain virtually unchanged. See Duncan and Leigh, "Wage Determination in the Union and Nonunion Sectors," pp.24-34.

capital interactions, which set them equal to zero. F-tests will be performed on the difference in the regression sum of squares due to the restrictions<sup>106</sup> to determine whether the union interaction terms significantly increase the explanatory power of the models. A significant F-value indicates that the null hypothesis, that there is no between the appreciable difference restricted and unrestricted coefficients, should be rejected.

The F-tests discussed above determine significant differences in groups of coefficients, but may not capture all relevant differences in equation structure. Therefore, additional statistical tests will be performed. two Differences in individual coefficients will be tested by means of pairwise t-tests. Since the experience measures are specified by complicated functional forms, and the stocks of PREV, TEN and the tenure segments differ between union and nonunion sectors, a final group of statistical tests will be performed. The derivatives of the estimated wage equations with respect to PREV and TEN will be calculated at the sample means, as will their standard errors.<sup>107</sup> Then, pairwise t-statistics of the difference in

<sup>106</sup> Specifically, the F-statistic to be used is:

$$F = \frac{RSS_u - RSS_r}{df_u - df_r} EMS_u$$

where: RSS = regression sum of squares, df = degrees of freedom, EMS = error mean square, and the u and r subscripts refer to restricted and unrestricted regression models.

these derivatives will be calculated in order to compare the effect on wages of a marginal change in each experience measure across sectors.

The analyses will be performed on a restricted occupational sample. As demonstrated in the literature review, estimates of union effects on returns to human capital will differ depending on the breadth of the sample. To avoid biased estimates arising from the negative correlation between indicators of professional, technical and managerial occupations and unionization, only occupations in which ten percent or more of the individuals are covered by a collective bargaining agreement will be included.

Separate wage equations will be used for the four race/sex groups, since differences in wage structure among demographic groups are known to exist.

<sup>&</sup>lt;sup>107</sup> The standard errors of the derivatives are equal to the square root of the variance of the derivative, which are calculated from the variances of the estimated coefficients.

#### CHAPTER V

### RESULTS OF THE EMPIRICAL ANALYSES

The results of the two empirical models developed in Chapter IV are reported below. The Experience Model contains an aggregate measure of current employer tenure, and the Training Model disaggregates tenure into three components. The results of these "pure" models are compared across union and nonunion sectors to estimate average union/nonunion differences in returns to human capital. In order to empirically test the hypothesized route of union influence, the SENINDEX and interaction terms among the seniority index and the human capital variables were added to the "pure" Experience and Training Models for individuals employed in the union sector. Due to frequent findings that wage structures differ significantly across race/sex groups, all models were estimated separately by race and sex. These empirical results by race and sex are discussed in light of the commonalities of union influence on wage determination across demographic groups. The findings will be interpreted in light of the theoretical expectations developed in Chapter IV.

The results of the regression analyses will be evaluated on the basis of two criteria. In order of

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importance, these criteria are: (1)the extent to which each model contributes to a clearer understanding of the channels through which unions influence wage determination; and (2) the standard statistical criterion of contribution to the explanatory power of the estimating equation. The latter statistical criterion is clearly important. The failure to reject the null hypothesis of no difference in union and nonunion equation structures, or no difference within the union sector, depending on the strength of seniority in promotion provisions, indicates that the hypotheses being are not supported empirically. tested If the null hypotheses can be rejected, however, it is important to determine whether the Training Model disentangles the complex effects on wage determination which unions are expected to cause. The decision to emphasize the Training Model's contribution to an understanding of the channels of union influence on wages is based on the lack of empirical investigation into these channels, and further, because the institutional literature on which the hypothesis development relies has never been adequately tested.

### Results from the Experience Models

Tables 5-1 and 5-2 contain the coefficient estimates from the "pure" Experience Model for men and women, respectively. Because the experience measures are specified using complicated functional forms, and because the average stocks of the experience components differ between union and nonunion sectors, partial derivatives of the wage equations with respect to PREV and TEN and their associated standard errors were calculated. Those results are displayed in results of Table 5-3. 5-4 displays the Table the SENINDEX/Experience Model. The upper panel of Table 5-5 contains the F-ratios which were computed to test the significance of average union/nonunion differences in the groups of experience coefficients. The lower panel of Table 5-5 contains the F-ratios on groups of SENINDEX-human capital interactions for individuals who are covered by a collective bargaining agreement. The upper panel of Table 5-6 shows t-ratios of the difference in single human capital coefficients between union and nonunion sectors.<sup>108</sup> The lower panel of Table 5-6 shows t-ratios of the difference in the derivatives of the Experience Model with respect to PREV and TEN between union and nonunion sectors.

### Union Effects on Returns to ED: Experience Models

The estimated ED coefficients of the "pure" Experience Model support the hypothesis that, relative to nonunion employees, collective bargaining coverage significantly reduces average returns to formal education for white men. (See Tables 5-1 and 5-6.) This finding is consistent with

<sup>&</sup>lt;sup>108</sup> The formula used for pairwise t-tests was: (bu-bn)/sqrt(su<sup>2</sup> + sn<sup>2</sup>) where: bu and bn are the estimated coefficients from the union and nonunion equations, respectively, and su and sn are the estimated standard errors.

|                                                                 | WHITE                     | MEN                          | NONWF    | HITE MEN |
|-----------------------------------------------------------------|---------------------------|------------------------------|----------|----------|
|                                                                 | UNION                     | NONUN I ON                   | UN I ON  | NONUNION |
| ED                                                              | .018**                    | .040**                       | .018*    | .014**   |
|                                                                 | (.006)                    | (.006)                       | (.007)   | (.005)   |
| PREV                                                            | .013*                     | .016**                       | .014*    | .014**   |
|                                                                 | (.005)                    | (.005)                       | (.007)   | (.004)   |
| PREV <sup>2</sup>                                               | 00016                     | 00017                        | 00026    | 00035**  |
|                                                                 | (.00012)                  | (.00013)                     | (.00019) | (.00010) |
| TEN                                                             | .033**                    | .045**                       | .029**   | .021**   |
|                                                                 | (.005)                    | (.007)                       | (.008)   | (.007)   |
| TEN <sup>2</sup>                                                | 00070**                   | 00077**                      | 00053*   | 00067**  |
|                                                                 | (.00015)                  | (.00020)                     | (.00025) | (.00025) |
| PREV*TEN                                                        | 00061**                   | 00082**                      | 00080*   | 00051    |
|                                                                 | (.00020)                  | (.00029)                     | (.00036) | (.00026) |
| CONSTANT                                                        | 5.59                      | 4.80                         | 5.60     | 5.62     |
| Adjusted<br>R <sup>2</sup>                                      | .385                      | .458                         | .310     | . 408    |
| N                                                               | 457. 5                    | 65.                          | 302.     | 415.     |
| Regression<br>df                                                | 35.                       | 35.                          | 34.      | 34.      |
| Controls:                                                       | FT, SMSA, R<br>OCCUPATION | EGION, LABOR<br>AND INDUSTRY | SUPPLY,  |          |
| <pre>**significant at .01 level *significant at .05 level</pre> |                           |                              |          |          |

Estimated Coefficients<sup>1</sup> of "Pure" Experience Model for Men, by Race and Union Status

<sup>1</sup>estimated standard errors in parentheses

Table 5-1

| Table | 5-2 |  |
|-------|-----|--|
|       |     |  |

Estimated Coefficients<sup>1</sup> of "Pure" Experience Model For Women, by Race and Union Status

|                                   | WHITE V                        | WOMEN                         | NONWHI   | TE WOMEN |
|-----------------------------------|--------------------------------|-------------------------------|----------|----------|
|                                   | UNION                          | NONUN I ON                    | UNION    | NONUNION |
| ED                                | .0052                          | .031**                        | .032**   | .024**   |
|                                   | (.0155)                        | (.007)                        | (.011)   | (.006)   |
| PREV                              | .016                           | .011*                         | 0095     | .014**   |
|                                   | (.012)                         | (.004)                        | (.0103)  | (.004)   |
| PREV <sup>2</sup>                 | 00034                          | 00013                         | 00053    | 00034**  |
|                                   | (.00035)                       | (.00013)                      | (.00033) | (.00013) |
| TEN                               | .033*                          | .033**                        | .040**   | .033**   |
|                                   | (.012)                         | (.006)                        | (.014)   | (.006)   |
| TEN <sup>2</sup>                  | 00053                          | 00077**                       | 0012*    | 00084**  |
|                                   | (.00035)                       | (.00024)                      | (.0006)  | (.00023) |
| PREV*TEN                          | 0016*                          | 00058*                        | 00061    | 00077*   |
|                                   | (.0007)                        | (.00029)                      | (.00058) | (.00030) |
| CONSTANT                          | 5.17                           | 5.03                          | 4.99     | 5.03     |
| Adjusted<br>R <sup>2</sup>        | . 293                          | . 383                         | .264     | . 412    |
| N                                 | 141.                           | 751.                          | 149.     | 520.     |
| Regression<br>df                  | 32.                            | 35.                           | 30.      | 34       |
| Controls:                         | FT, SMSA, RE<br>OCCUPATION,    | GION, LABOR S<br>and INDUSTRY | SUPPLY,  |          |
| <pre>**significa *significa</pre> | ant at .01 le<br>ant at .05 le | vel<br>vel                    |          |          |
| <sup>1</sup> estimated            | standard err                   | ors in parent                 | theses   |          |

| Pa<br>With Res            | rtial Deri<br>pect to PR<br>by Rac | vatives <sup>1</sup> of<br>EV and TEN,<br>e, Sex, and | the Wage Equat:<br>"Pure" Experien<br>Union Status | ion <sup>2</sup><br>nce Model, |
|---------------------------|------------------------------------|-------------------------------------------------------|----------------------------------------------------|--------------------------------|
|                           | WHITE                              | MEN                                                   | NONWHITI                                           | E MEN                          |
|                           | UNION                              | NONUN I ON                                            | UNION                                              | NONUNION                       |
| dlnW/dPREV                | .0032                              | .0072**                                               | .0021                                              | .003 <b>4</b>                  |
|                           | (.0019)                            | (.0022)                                               | (.0029)                                            | (.0021)                        |
| dlnW/dTEN                 | .013**                             | .027**                                                | .013**                                             | .0060                          |
|                           | (.002)                             | (.003)                                                | (.003)                                             | (.0033)                        |
|                           | WHITE                              | WOMEN                                                 | NONWHITI                                           | E WOMEN                        |
|                           | UNION                              | NONUN I ON                                            | UNION                                              | NONUNION                       |
| dlnW/dPREV                | 0012                               | .0059**                                               | 0037                                               | .0050**                        |
|                           | (.0060)                            | (.0022)                                               | (.0040)                                            | (.0019)                        |
| dlnW/dTEN                 | .014*                              | .023**                                                | .020*                                              | .017**                         |
|                           | (.005)                             | (.003)                                                | (.007)                                             | (.004)                         |
| **significa<br>*significa | nt at .01<br>nt at .05             | level<br>level                                        |                                                    |                                |

<sup>1</sup>derivatives were calculated at sample means <sup>2</sup>estimated standard errors in parentheses

Table 5-3

|                        | WHITE     | NONWHITE  | WHITE           | NONWHITE  |
|------------------------|-----------|-----------|-----------------|-----------|
|                        | MEN       | MEN       | WOMEN           | WOMEN     |
| ED                     | .028      | .032*     | .036            | .017      |
|                        | (.016)    | (.015)    | (.027)          | (.022)    |
| PREV                   | .017      | .060**    | 012             | 017       |
|                        | (.013)    | (.017)    | (.026)          | (.022)    |
| PREV <sup>2</sup>      | 000088    | 0013**    | .00016          | .00085    |
|                        | (.000320) | (.0004)   | (.00096)        | (.00065)  |
| TEN                    | .036*     | .055*     | .055            | .043      |
|                        | (.015)    | (.021)    | (.031)          | (.033)    |
| TEN <sup>2</sup>       | 00058     | 00093     | 0028*           | 0020      |
|                        | (.00044)  | (.00058)  | (.0012)         | (.0016)   |
| PREV*TEN               | 0011      | 0022**    | 00015           | 00071     |
|                        | (.0006)   | (.0009)   | (.00181)        | (.00139)  |
| SENINDEX               | .014      | .056*     | .021            | 012       |
|                        | (.022)    | (.024)    | (.03 <b>4</b> ) | (.024)    |
| ED*SEN                 | 0011      | 0018      | 0027            | .0011     |
|                        | (.0015)   | (.0015)   | (.0025)         | (.0016)   |
| PREV*SEN               | 00030     | 0046**    | .0036           | .00052    |
|                        | (.00124)  | (.0016)   | (.0031)         | (.00196)  |
| PREV <sup>2</sup> *SEN | 000017    | .00010*   | 000066          | 000032    |
|                        | (.000030) | (.00004)  | (.000120)       | (.000060) |
| TEN*SEN                | 00073     | 0026      | 0024            | 00066     |
|                        | (.00141)  | (.0020)   | (.0031)         | (.00283)  |
| TEN <sup>2</sup> * SEN | .0000011  | .000035   | .00022          | .000062   |
|                        | (.000040) | (.000060) | (.00012)        | (.000140) |

Estimated Coefficients<sup>1</sup> of SENINDEX/Experience Model, by Race and Sex, Union Sector

# Table 5-4

|                            | WHITE<br>MEN                 | NONWHITE<br>MEN             | WHITE<br>WOMEN    | NONWHITE<br>WOMEN    |
|----------------------------|------------------------------|-----------------------------|-------------------|----------------------|
| PR*TEN*SEN                 | .000052<br>(.000060)         | .00014<br>(.00008)          | 00018<br>(.00017) | .000033<br>(.000120) |
| Constant                   | 5.46                         | 5.07                        | 4.91              | 5.24                 |
| Adjusted<br>R <sup>2</sup> | .379                         | .325                        | .352              | .216                 |
| N                          | 407.                         | 279.                        | 131.              | 141.                 |
| Regression<br>df           | 42.                          | 41.                         | 39.               | 37.                  |
| Controls:                  | FT, SMSA, R<br>OCCUPATION,   | EGION, LABOR<br>and INDUSTR | SUPPLY,<br>Y      |                      |
| **significa<br>*significa  | ant at .01 l<br>ant at .05 l | evel<br>evel                |                   |                      |
| <sup>1</sup> estimated     | standard er                  | rors in pare                | ntheses           |                      |

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|----|----|---|----|---|
|----|----|---|----|---|

F-Statistics Testing Average Union/Nonunion Differences, and the Effect of Seniority Provisions on Returns to Human Capital, by Race and Sex, Experience Models

|                                                                  | WHITE<br>MEN | NONWHITE<br>MEN | WHITE<br>WOMEN | NONWH I TE<br>WOMEN |  |  |  |
|------------------------------------------------------------------|--------------|-----------------|----------------|---------------------|--|--|--|
| AVERAGE UNION EFFECT                                             |              |                 |                |                     |  |  |  |
| All Human<br>Capital                                             | 2.78*        | 1.47            | 0.93           | 1.20                |  |  |  |
| All TEN                                                          | 4.50**       | 2.68*           | 0.82           | 0.15                |  |  |  |
| All PREV                                                         | 0.38         | 0.44            | 1.18           | 2.03                |  |  |  |
| All<br>Variables                                                 | 3.46**       | 1.87**          | 1.14           | 1.13                |  |  |  |
| SENINDEX EFFECTS                                                 |              |                 |                |                     |  |  |  |
| All Human<br>Capital                                             | 0.79         | 1.56            | 1.93           | 0.33                |  |  |  |
| All TEN                                                          | 0.51         | 1.03            | 2.26           | 0.31                |  |  |  |
| All PREV                                                         | 1.46         | 2.82*           | 0.78           | 0.17                |  |  |  |
| <pre>**significant at .01 level  *significant at .05 level</pre> |              |                 |                |                     |  |  |  |
## Table 5-6

t-Statistics for Pairwise Comparison of Single Union and Nonunion Coefficients, and for Comparison of the Partial Derivatives of the Wage Equation with Respect to PREV and TEN, "Pure" Experience Model

|                   | WHITE<br>MEN | NONWH I TE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|-------------------|--------------|-------------------|----------------|-------------------|
| ED                | -2.59**      | 0.46              | -1.52          | 0.64              |
| PREV              | -0.42        | 0.03              | 0.31           | -2.13*            |
| PREV <sup>2</sup> | 0.06         | 0.42              | -0.56          | 2.45**            |
| TEN               | -1.39        | -0.38             | 00.03          | 0.46              |
| TEN <sup>2</sup>  | 0.28         | 0.33              | 0.57           | -0.56             |
| PREV*TEN          | 0.60         | -0.65             | -1.35          | 0.24              |
| dlnW/dPREV        | -1.00        | -0.36             | -1.09          | -1.95             |
| dlnW/dTEN         | -3.93**      | 1.52              | -1.41          | 0.34              |
| <b></b>           |              | 2 2               |                |                   |

\*\*significant at .01 level
\*significant at .05 level

the expectation that, by reducing the prevalence of merit review and individual determination plans as a means of pricing job structures, unions will depress returns to general human capital. This finding is also consistent with all prior investigations into union effects on returns to human capital of white men.

In contrast, the estimated union effect on returns to education for nonwhite men and nonwhite women (in Table 5-6) is positive, but is not statistically significant. The nonsignificant difference in the ED coefficients between union and nonunion nonwhites supports a conclusion that unions do not alter returns to education for nonwhites. This finding is consistent with the results of Leigh's study<sup>109</sup> for young black men.

At first glance, the conclusion that collective bargaining coverage does not alter nonwhites' returns to education appears to contradict a priori expectations. In a narrow sense, it does. However, the expectation that unions will reduce returns to formal education was derived from a broader analysis of union effects in which the reduced prevalence of merit review plans, and the increased prevalence of single job rates in the union sector, are means by which unions attempt to base wages on job characteristics, as opposed to individual characteristics. Unions pursue such a strategy to minimize both the use of

<sup>109</sup> Leigh, "Racial Differentials in Union Relative Wage Effects."

supervisory judgment and competition among bargaining unit The nonunion sector results (displayed in Tables members. 5-1 and 5-2) indicate that nonwhites receive substantially lower returns to education than do whites. Furthermore, the race difference in the estimated ED coefficients is statistically significant for nonunion sector men. In contrast, the union sector ED coefficients do not differ significantly between whites and nonwhites. The finding that unions do not significantly alter returns to education for nonwhites is broadly consistent with the proposition that unions equalize the treatment of individuals, by basing wages on the jobs performed, rather than on individual characteristics, including race.

Unions do not significantly reduce the returns white women receive for education. To anticipate the findings based on all model specifications, the results, with one exception, provide no evidence in support of the proposition that unions significantly alter wage determination for white or nonwhite women. An explanation for the nonsignificant union effects on women's wages will follow the presentation of findings and interpretations of all model specifications. Discussion will focus on interpreting the results which attain statistical significance, and thus warrant close scrutiny.

The SENINDEX/Experience Model results in Table 5-4 indicate that for all race/sex groups, the union influence

on returns to education does not vary with the strength of seniority in promotion provisions. Increased hiring standards in the union sector were expected to be a positive function of the strength of seniority in promotion provisions. Once the average union effect of increasing hiring standards is held constant via the within-union sector analysis, there appears to be no differential effect of the strength of seniority provisions on employee returns to education, as indicated by the nonsignificant ED\*SEN coefficients. This finding may indicate that union sector employers who have more latitude in promotion decisions (because they are not subject to a strict seniority criterion), still prefer to promote on the basis of seniority whenever possible. Thus, in order to avoid grievances challenging promotion decisions which are based on judgments of ability, all unionized employers may increase educational hiring standards equally. A uniform increase in hiring standards within the union sector is consistent with the institutional literature which emphasizes the "head and shoulders" principle used by arbitrators.

Once increased hiring standards are "netted out," union influence on employee returns to education is expected to occur through the reduced prevalence of merit review and of individual determination plans. The results of the "pure" Experience and SENINDEX/Experience Models suggest that union influence on the manner in which evaluation-defined job structures are priced, in terms of educational requirements, is invariant with respect to seniority in promotion provisions. That is, the strength of seniority in promotion provisions has no independent effect on the use of single job rates in the union sector.

# Union Effects on Returns to PREV: Experience Models

The F-statistics testing for the equality of the group of PREV coefficients between union and nonunion sectors (in the upper panel of Table 5-5), and the t-statistics comparing the derivatives of the wage equation with respect to PREV between union and nonunion sectors (in the lower panel of Table 5-6), do not support the proposition that unions reduce average returns to previous experience for any of the race/sex groups. Because PREV is acquired in the external labor market and should consist primarily of general OJT, returns to PREV were expected to be subject to precisely the same forces which reduce average returns to education. The finding that average returns to PREV do not differ between union and nonunion sectors can be explained in a number of ways. However, for nonwhite men, one cannot conclude that collective bargaining coverage does not affect returns to PREV. The results of the SENINDEX/Experience Model (in Table 5-4) and the F-tests on the PREV-SEN interactions (in Table 5-5) indicate that returns to previous experience are significantly reduced for nonwhite men within the union sector as seniority in promotion provisions increase in strength.

One possible explanation for the apparently conflicting results of the "pure" and SENINDEX/Experience Models relates to the assumption that PREV primarily consists of general training in both union and nonunion sectors. One way in which union sector employers may respond to the union wage effect is by selecting hires on the basis of related previous experience.<sup>110</sup> If employers are able to select on this basis, the stocks of PREV which union sector workers possess will be systematically more related to their current firm than the PREV possessed by nonunion workers. The data contain no information on the occupation or industry in which PREV was acquired, so it is not possible to control for differences in the relatedness of PREV between union and nonunion sectors. Consequently, the apparent equality of PREV coefficients between union and nonunion sectors may reflect two analytically distinct and offsetting union unions may reduce returns to general effects: human capital, as hypothesized, but may also increase the degree to which PREV is related to jobs with the current firm.

<sup>&</sup>lt;sup>110</sup> This possibility was discussed in Chapter III. Unionized employers may seek out individuals with related experience, but they were not expected to be able to hire substantial numbers of such individuals. Union-induced quit reductions were expected to limit the supply of individuals with related previous experience.

It is possible to establish a hierarchy in union sector firms whereby returns to general human capital acquired in the external labor market are most depressed, returns to related training acquired externally are less depressed, and returns to firm-specific training are increased relative to the nonunion sector. This hierarchy of union effects on returns to externally acquired human capital could be established by the manner in which previous experience is scored in job evaluation plans. Experience points are usually assigned to jobs based on the amount of time on the job needed for the worker to become competent at the job, and on the amount of related previous experience required for the job.<sup>111</sup> Collective bargaining coverage may induce employers to increase the hiring standard for previous related experience above that actually required for the job. The amount of related experience required will be reflected fully by the job's evaluation points for previous experience. In this manner, returns to related PREV will be increased relative to fully general PREV within the union However, returns to related experience above job sector. requirements will be depressed through the increased prevalence of single job rates in unionized firms.

<sup>&</sup>lt;sup>111</sup> See, for example, "Job Evaluation Plan for Production and Related Jobs." (Westchester, Ill.: Midwest Industrial Management Association), undated, No. 100.

Comparison of the different results for ED and PREV yields additional insight into the manner in which seniority provisions exert their influence. Formal education is, by definition, completely general human capital. In contrast, PREV is composed of varying degrees of fully general and related training. There may be a limit to the amount of additional education which will be productive for most private sector unionized occupations which are preponderantly blue-collar, and thus have relatively low formal educational requirements. In addition, the screening costs for education are very low. Therefore, in response to the union wage effect and seniority in promotion provisions, all unionized employers can be expected to raise educational hiring standards equally, without regard to the relative strength of the seniority criterion. A uniform increase in educational hiring standards in the union sector does not imply that seniority provisions have no effect. Rather, it implies that these provisions are codified and enforced only in the union sector. It is the presence of codified rules, and not their relative strength, which increases educational hiring standards.

The supply of individuals who possess related previous experience is expected to be limited, so, in contrast to education, hiring decisions based on related PREV may require increased screening costs for checking references. Employers who have agreed to a strong seniority in promotion clause may be willing to incur increased screening costs to avoid the difficulties which may accompany the promotion of a junior worker. Consequently, there may be a positive relationship between the strength of seniority in promotion provisions and hiring standards for related previous experience. This explanation may account for the significant effect of SENINDEX on PREV (PREV\*SEN), although average returns to PREV do not differ between nonwhite men in the union and nonunion sectors.

The sign of the PREV\*SEN coefficient for white men is consistent with the above interpretation, although the F-statistic on all PREV terms falls short of statistical significance. This analysis cannot determine whether the difference between white and nonwhite men in the significance of estimated SENINDEX effects on returns to PREV is due to a more restricted supply of white men with related previous experience, or to differential iob assignment by race (for which the one-digit occupation variables do not adequately control), or whether it is due to some other possible explanation.

The estimation of equal average returns to previous work experience conflicts with the interpretations given by all prior investigators who have estimated union effects on returns to human capital. This contradiction may be a result of the aggregate experience proxies which have been used in prior work, and which are likely to confound a variety of union influences.<sup>112</sup>

## Union Effects on Returns to TEN: Experience Models

As anticipated, average returns to current employer tenure differ significantly between union and nonunion sectors. The F-ratio calculated from the restriction on all tenure coefficients is significant for both white and nonwhite men (See Table 5-5), although the t-ratio, which compares the derivative of the wage equation with respect to TEN from the union and nonunion equations, is significant only for white men (See Table 5-6). The positive differences in the estimated TEN<sup>2</sup> union/nonunion coefficients are consistent with the expectation that collective bargaining coverage alters the timing of the provision of OJT within the total tenure segment. It must be noted, however, that the results do not confirm the expected shifts in timing. It might be concluded, based on the Experience Model estimates, that collective bargaining coverage reduces employee returns to all tenure with the current employer. Cogent interpretation of these results will be contingent upon the results of the "pure" Training Model discussed below.

<sup>&</sup>lt;sup>112</sup> See the Literature Review for a discussion of the potential problems which may arise from using total experience proxies for estimating the routes of union influence on wages.

In contrast to the estimates of average union/nonunion differences in employee returns to tenure, the results of the SENINDEX/Experience Model do not support a priori expectations of the effect of strong seniority in promotion provisions on internal labor market dynamics in the union Codified seniority provisions were expected to sector. increase unionized employees' returns to tenure on the job received by promotion, relative to nonunion employees' returns, by tying promotion probabilities to length of Within the union sector, however, employees' service. returns to tenure in all jobs were expected to be progressively reduced, as the seniority in promotion provisions increased in strength. The hypothesis concerning the effect of SENINDEX within the union sector was based on the expectation that a more automatic promotion decision would reduce the wage increment necessary to bring about the desired internal mobility. The coefficient of TEN\*SEN was, therefore, expected to be negative. The sign of the TEN\*SEN coefficient is consistent with the hypothesis for white and nonwhite men, but the SENINDEX-tenure interactions fail to attain statistical significance, either individually or as a group. (See Tables 5-4 and 5-5.)

As the weight accorded to the seniority criterion increases, individuals must wait longer to receive a promotion and the additional "advanced training" which is expected to accompany promotion. The delayed receipt of

advanced training implies that the wage-tenure profile will peak later where strong seniority provisions are present. The coefficient of TEN<sup>2</sup>\*SEN was, therefore, expected to be Although the sign of TEN<sup>2</sup>\*SEN is positive. in the hypothesized direction for unionized men of both races, the coefficients are not statistically significant. (See Table 5-4.) Strong seniority provisions were also expected to increase the number of job incumbents who receive substantial amounts of specific training. In order to carry out a policy of promotion from within, the concomitant "advancéd" training must be provided. Within a restricted specific OJT was hypothesized to age range, depend positively on PREV, while the receipt of general OJT was expected to depend negatively on PREV. As a result of the differential dependence of general and specific OJT on PREV, and the expectation that the amount of specific training received increases at the time of promotion, PREV\*TEN\*SEN was expected to have a positive effect on wages. As with the other SENINDEX-TEN interaction coefficients, the estimated signs are as hypothesized, but they are not statistically significant for either group of union sector men.

#### Results from the Training Models

The Training Model has the potential ability to capture the opposing effects of collective bargaining coverage on returns to tenure before and after promotion. The

disaggregation of total tenure was also expected to differentiate between union effects on "lump-sum" employee returns to OJT as a particular type of skill differential, returns to training which accrue as tenure is and accumulated. The results of the "pure" Training Model for men are displayed in Table 5-7 and for women in Table 5-8. The derivatives of the estimated wage equations are reported in Table 5-9; the SENINDEX/Training Model estimates are contained in Table 5-10. The F-statistics on the significance of various restrictions are found in Table upper panel of Table 5-12 5-11. The reports the t-statistics for comparing single coefficients between union and nonunion sectors, and the lower panel reports t-statistics comparing the derivatives of the wage equations with respect to PREV and the tenure segments between the two sectors.

|                                                                       | WHITE M                      | IEN            | NONWHI       | TE MEN   |  |
|-----------------------------------------------------------------------|------------------------------|----------------|--------------|----------|--|
|                                                                       | UNION                        | NONUN I ON     | UNION        | NONUNION |  |
| ED                                                                    | .014*                        | .037**         | .014*        | .013*    |  |
|                                                                       | (.006)                       | (.006)         | (.007)       | (.006)   |  |
| PREV                                                                  | .011*                        | .01 <b>4**</b> | .01 <b>4</b> | .016**   |  |
|                                                                       | (.005)                       | (.005)         | (.007)       | (.005)   |  |
| PREV <sup>2</sup>                                                     | 000099                       | 00019          | 00021        | 00046**  |  |
|                                                                       | (.000120)                    | (.00014)       | (.00019)     | (.00014) |  |
| PRETEN                                                                | .0036                        | .021**         | .010         | .0047    |  |
|                                                                       | (.0022)                      | (.004)         | (.005)       | (.0049)  |  |
| OJT                                                                   | .038**                       | .067**         | .061**       | .038*    |  |
|                                                                       | (.008)                       | (.010)         | (.017)       | (.015)   |  |
| Posten                                                                | .033**                       | .0075          | .022*        | .014     |  |
|                                                                       | (.006)                       | (.0087)        | (.009)       | (.008)   |  |
| PREV*PRET                                                             | 000019                       | 00084*         | 00058        | 00026    |  |
|                                                                       | (.000230)                    | (.00038)       | (.00050)     | (00042)  |  |
| PREV*POST                                                             | 0015**                       | 000037         | 0013         | 00033    |  |
|                                                                       | (.0004)                      | (.000560)      | (.0007)      | (.00052) |  |
| Constant                                                              | 5.60                         | 4.89           | 5.62         | 5.66     |  |
| Adjusted<br>R <sup>2</sup>                                            | . 404                        | . 477          | .335         | .397     |  |
| N                                                                     | 451. 5                       | 556.           | 294.         | 401.     |  |
| Regression<br>df                                                      | 37.                          | 37.            | 36.          | 36.      |  |
| Controls: FT, SMSA, REGION, LABOR SUPPLY,<br>OCCUPATION, and INDUSTRY |                              |                |              |          |  |
| **signific<br>*signific                                               | ant at .01 ]<br>ant at .05 ] | level<br>Level |              |          |  |
| <sup>1</sup> estimated                                                | l standard ei                | rors in par    | entheses     |          |  |

| Table | 5-7 |
|-------|-----|
|-------|-----|

Estimated Coefficients<sup>1</sup> of "Pure" Training Model for Men, by Race and Union Status

| Т | ab | 1 | е | 5 | - | 8 |
|---|----|---|---|---|---|---|
|---|----|---|---|---|---|---|

|                            | WHITE                    | WOMEN                         | NONWHIT         | E WOMEN  |
|----------------------------|--------------------------|-------------------------------|-----------------|----------|
|                            | UNION                    | NONUN I ON                    | UNION           | NONUNION |
| ED                         | .0080                    | .031**                        | .031**          | .023**   |
|                            | (.0155)                  | (.007)                        | (.011)          | (.006)   |
| PREV                       | .012                     | .010*                         | 0097            | .014**   |
|                            | (.012)                   | (.004)                        | (.0105)         | (.004)   |
| PREV <sup>2</sup>          | 00080*                   | 00019                         | .00050          | 00043**  |
|                            | (.00039)                 | (.00013)                      | (.00035)        | (.00014) |
| PRETEN                     | .019**                   | .018**                        | .0092           | .025**   |
|                            | (.005)                   | (.004)                        | (.0126)         | (.005)   |
| OJT                        | .032                     | .10**                         | 016             | .076*    |
|                            | (.051)                   | (.02)                         | (.039)          | (.031)   |
| Posten                     | 010                      | .012                          | .019            | 00078    |
|                            | (.012)                   | (.006)                        | (.014)          | (.03058) |
| PREV*PRET                  | 0023**                   | 0011*                         | 00034           | 0021**   |
|                            | (.0007)                  | (.0005)                       | (.00094)        | (.0005)  |
| PREV*POST                  | .0022                    | 000019                        | 00036           | .00058   |
|                            | (.0013)                  | (.00050)                      | (.00103)        | (.00050) |
| Constant                   | 5.29                     | 5.07                          | 5.06            | 5.14     |
| Adjusted<br>R <sup>2</sup> | .326                     | . 399                         | .217            | .416     |
| N                          | 142.                     | 737.                          | 147.            | 505.     |
| Regression<br>df           | 34.                      | 37.                           | 32.             | 36.      |
| Controls:                  | FT, SMSA,<br>OCCUPATION  | REGION, LABO<br>I, and INDUST | R SUPPLY,<br>RY |          |
| **signific<br>*signific    | ant at .01<br>ant at .05 | level<br>level                |                 |          |
| <sup>1</sup> estimated     | standard e               | errors in par                 | entheses        |          |

Estimated Coefficients<sup>1</sup> of "Pure" Training Model for Women, by Race and Union Status

| Tab | le | 5-9 |
|-----|----|-----|
|-----|----|-----|

Partial Derivatives<sup>1</sup> of the Wage Equation<sup>2</sup> With Respect to PREV and TEN, "Pure" Training Model, by Race, Sex, and Union Status

|                               | WHITE                  | MEN          | NONWHITE MEN |            |
|-------------------------------|------------------------|--------------|--------------|------------|
|                               | UNION                  | NONUNION     | UNION        | NONUNION   |
| dlnW/dPREV                    | .0053**                | .011**       | .022         | .0040      |
|                               | (.0019)                | (.002)       | (.003)       | (.0021)    |
| dlnW/dPRETEN                  | .0035                  | .013**       | .0045        | 0056       |
|                               | (.0018)                | (.003)       | (.0031)      | (.0035)    |
| dlnW/dPOSTEN                  | .023**                 | .0071        | .0093        | .010       |
|                               | (.004)                 | (.0059)      | (.0061)      | (.005)     |
|                               | WHITE                  | WOMEN        | NONWHITE     | WOMEN      |
|                               | UNION                  | NONUN I ON   | UNION        | NONUN I ON |
| dlnW/PREV                     | 015**                  | .0057**      | 0030         | .0046      |
|                               | (.006)                 | (.0022)      | (.0042)      | (.0019)    |
| dlnW/dPRETEN                  | .0047                  | .011**       | .0062        | .0060      |
|                               | (.0042)                | (.003)       | (.007)       | (.0033)    |
| dlnW/dPOSTEN                  | .0040                  | .011*        | .016         | .0043      |
|                               | (.0089)                | (.004)       | (.010)       | (.0048)    |
| **significant<br>*significant | at .01 le<br>at .05 le | evel<br>evel |              |            |

<sup>1</sup>derivatives were calculated at sample means <sup>2</sup>estimated standard errors in parentheses

| Table | 5-10 |  |
|-------|------|--|

Estimated Coefficients<sup>1</sup> of SENINDEX/Training Model, by Race and Sex, Union Sector

|                         | WHITE     | NONWHITE | WHITE         | NONWH I TE |
|-------------------------|-----------|----------|---------------|------------|
|                         | MEN       | MEN      | WOMEN         | WOMEN      |
| ED                      | .025      | .028     | .0 <b>4</b> 0 | .020       |
|                         | (.016)    | (.015)   | (.029)        | (.024)     |
| PREV                    | .014      | .062**   | 0017          | 015        |
|                         | (.012)    | (.017)   | (.0280)       | (.022)     |
| PREV <sup>2</sup>       | .00000099 | 0013**   | 00069         | .00083     |
|                         | (.00031)  | (.0004)  | (.00122)      | (.00071)   |
| PRETEN                  | .010      | 0029     | .020          | .0032      |
|                         | (.008)    | (.0151)  | (.022)        | (.0362)    |
| OJT                     | .076**    | .13*     | .050          | 12         |
|                         | (.021)    | (.05)    | (.134)        | (.09)      |
| Posten                  | .028      | .070**   | 011           | .015       |
|                         | (.020)    | (.026)   | (.038)        | (.031)     |
| PREV*PRET               | 00048     | .00065   | 0054*         | .00016     |
|                         | (.00088)  | (.00138) | (.0026)       | (.00071)   |
| PREV*POST               | 0032*     | 0051**   | .0025         | 0016       |
|                         | (.0016)   | (.0016)  | (.0034)       | (.0022)    |
| SENINDEX                | .013      | .060*    | .022          | 012        |
|                         | (.022)    | (.023)   | (.036)        | (.027)     |
| ED*SEN                  | 0013      | 0019     | 0028          | .00043     |
|                         | (.0015)   | (.0016)  | (.0030)       | (.00192)   |
| PREV*SEN                | 000025    | 0049**   | .0015         | .00022     |
|                         | (.00119)  | (.0016)  | (.0034)       | (.00205)   |
| PREV <sup>2</sup> * SEN | 000021    | .00010*  | 000018        | 000026     |
|                         | (.000030) | (.00004) | (.000140)     | (.000060)  |

|                                       | WHITE                        | NONWHITE    | WHITE     | NONWHITE     |
|---------------------------------------|------------------------------|-------------|-----------|--------------|
|                                       | MEN                          | MEN         | WOMEN     | WOMEN        |
| PRET*SEN                              | 00065                        | .00063      | .00020    | .00018       |
|                                       | (.00070)                     | (.00133)    | (.00202)  | (.00281)     |
| OJT*SEN                               | 0038                         | 0071        | 00014     | .01 <b>4</b> |
|                                       | (.0020)                      | (.0053)     | (.01074)  | (.011)       |
| POST*SEN                              | .00041                       | 0040        | 00067     | 00017        |
|                                       | (.00187)                     | (.0024)     | (.00432)  | (.00253)     |
| PREV*PRET*SEN                         | .000052                      | 000080      | .00021    | 000035       |
|                                       | (.000070)                    | (.000120)   | (.00022)  | (.00020)     |
| PREV*POST*SEN                         | .00012                       | .00035*     | .000036   | .00014       |
|                                       | (.00013)                     | (.00015)    | (.000390) | (.00018)     |
| CONSTANT                              | 5.47                         | 5.07        | 4.96      | 5.29         |
| Adjusted<br>R <sup>2</sup>            | .411                         | .359        | .376      | .157         |
| Regression<br>df                      | 46.                          | 45.         | 43.       | 41.          |
| N 40                                  | 02. 2                        | 271.        | 131.      | 139.         |
| Controls: FT<br>OC                    | , SMSA, REGI<br>CUPATION, an | ON, LABOR S | UPPLY,    |              |
| <pre>**significant *significant</pre> | at .01 leve<br>at .05 leve   | 21<br>21    |           |              |

Table 5-10 (cont'd.)

<sup>&</sup>lt;sup>1</sup>estimated standard errors in parentheses

| Т | ab | 1 | е | 5- | 1 | 1 |
|---|----|---|---|----|---|---|
|---|----|---|---|----|---|---|

F-Statistics Testing Average Union/Nonunion Differences, and the Effect of Seniority Provisions on Returns to Human Capital, by Race and Sex, Training Models

|                                       | WHITE<br>MEN           | NONWH I TE<br>MEN | WHITE<br>WOMEN | NONWH I TE<br>WOMEN |
|---------------------------------------|------------------------|-------------------|----------------|---------------------|
|                                       | AVE                    | RAGE UNION EFF    | ECTS           |                     |
| All Human<br>Capital                  | 4.68**                 | 1.91              | 1.49           | 1.63                |
| All TEN                               | 6.36**                 | 2.70*             | 1.67           | 1.58                |
| All PREV                              | 2.23                   | 1.20              | 1.50           | 2.04                |
| PREV-TEN<br>Interactions              | 3.73**                 | 1.97**            | 1.36           | 1.27                |
|                                       | S                      | ENINDEX EFFECT    | rs             |                     |
| All Human<br>Capital                  | 1.27                   | 1.91              | 1.45           | 0.44                |
| All TEN                               | 1.70                   | 1.44              | 0.76           | 0.62                |
| All PREV                              | 1.08                   | 2.94*             | 1.44           | 0.20                |
| PREV-TEN<br>Interactions              | 1.09                   | 2.78*             | 0.46           | 0.30                |
| <pre>**significant *significant</pre> | at .01 le<br>at .05 le | evel              |                |                     |

### Table 5-12

t-Statistics for Pairwise Comparisons of Single Union and Nonunion Coefficients, and for Comparison of the Partial Derivatives of the Wage Equation With Respect to PREV and the TEN Segments, by Race and Sex, "Pure" Training Model

|                   | WHITE<br>MEN | NONWH I TE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|-------------------|--------------|-------------------|----------------|-------------------|
| ED                | -2.71**      | 0.11              | -1.35          | 0.64              |
| PREV              | -0.42        | -0.23             | 0.16           | -2.11*            |
| PREV <sup>2</sup> | 0.49         | 1.06              | -1.49          | 2.47**            |
| PRETEN            | -3.81**      | 0.76              | 0.16           | -1.16             |
| OJT               | -2.26*       | 1.81*             | -1.24          | -1.85*            |
| POSTEN            | 2.41**       | 0.66              | -1.64          | 0.59              |
| PREV*PRET         | 1.85*        | -0.49             | -1.39          | 1.66              |
| PREV*POST         | -2.12*       | -1.11             | 1.59           | -0.82             |
| dlnW/dPREV        | -1.96        | -0.02             | -3.40**        | -1.63             |
| dlnW/dPRETEN      | -2.65**      | -0.24             | -1.14          | 0.02              |
| dlnW/dPOSTEN      | 2.21*        | -0.03             | -0.74          | 1.06              |

\*\*significant at .01 level
 \*significant at .05 level

# Union Effects on Returns to PREV: Training Model

Prior to discussing the effects of collective bargaining coverage on returns to the tenure components, the Training Model estimates of union effects on returns to previous experience merit consideration. The t-test comparing the derivatives of the wage equation with respect to PREV indicates that union coverage significantly reduces white women's returns to previous experience. (See Table 5-12.) This finding may be explained by the hypothesis that a hierarchy of union-induced reductions in returns to externally acquired human capital may be established within unionized firms. Returns to fully general OJT acquired through PREV were expected to be most depressed, returns to related OJT acquired through PREV were expected to be less depressed, and returns to firm-specific OJT were expected to be increased by collective bargaining coverage, relative to the nonunion sector. This hierarchy was expected to result from the manner in which experience requirements of jobs are rated by job evaluation, as well as the increased prevalence of single job rates within the union sector.

There are at least two explanations for finding that unions significantly reduce returns to previous experience only among white women. Union sector white women may not possess substantial amounts of related PREV, so that the union effect of reducing returns to fully general PREV dominates the union effect on hiring standards.

Alternatively, white women may be assigned to jobs in which the requirements for previous experience are minimal. Differential job assignment may reflect employer decisions which are based on average sex differences in prior labor force attachment.

It is important to note that, contrary to the results of the Training Model, the results of the Experience Model would have led to the conclusion that unions do not significantly reduce average returns to previous experience for white women. The Training Model provides for the amount of OJT received on the initial job to differ in its dependence on PREV from the OJT received on a subsequent job. The difference in results between the Experience Model and the Training Model appears to stem from this provision of the Training Model.

The OJT an individual receives in the initial job with an employer was expected to consist primarily of general training. The amount of OJT received in the initial position was, therefore, expected to be reduced as the amount of PREV an employee possesses increases. The coefficient of PREV\*PRET is negative and significant for white unionized women, thus supporting this hypothesis. (See Table 5-8.)

The OJT an individual receives upon promotion was expected to consist of more specific than general training. As a consequence, the amount of OJT received during POSTEN was not expected to be substantially reduced by the amount of PREV. The negative, but nonsignificant PREV\*POST coefficient for white union sector women is consistent with this hypothesis, but does not permit its acceptance. (See Table 5-8.)

# Union Effects on Returns to PRETEN: Training Model

Relative to the nonunion sector, collective bargaining coverage significantly alters employee returns to the group of tenure segments for both white and nonwhite men. (See Table 5-11.) This general finding is consistent with the results of the "pure" Experience Model. In contrast to the Experience Model results, the Training Model provides strong evidence in support of the proposition that unions alter returns to PRETEN and POSTEN in opposite directions among white men. Specifically, white men covered by a collective bargaining agreement receive lower returns to PRETEN than do nonunion white men. The t-ratios, which compare the single PRETEN coefficients and the partial derivatives of the wage equations with respect to PRETEN between union and nonunion sectors, are significant at the one percent level. (See Tables 5-9 and 5-12.) The significant union/nonunion difference in returns to PRETEN between white men in the union and nonunion sectors supports the hypothesis that collective bargaining coverage reduces average employee returns to tenure in the initial job.

Reduced returns to PRETEN were expected to result from a union-induced increase in general human capital hiring standards which would, as a consequence, reduce the general training provided on the initial job. Unions were expected to increase the amount of specific training provided by the employer only by tying promotion probabilities to length of Indeed, the asymmetrical effects of seniority service. provisions were expected to reduce the probability that low workers will receive promotion, tenure a while simultaneously increasing their probability of layoff. Collective bargaining coverage was, therefore, expected to induce employers to minimize the amount of specific training provided on the initial job, as well as the amount of general training which is provided.

Since the amount of OJT received during PRETEN is not observed, the PRETEN coefficient may also be capturing the union effect of reducing the share of OJT which is employee-financed. Union reduction of the share of OJT which employees finance will further reduce employee returns to PRETEN. Additionally, PRETEN may be capturing the effect of internal mobility on wages, since only individuals who have changed jobs with the current employer possess positive A smaller PRETEN coefficient would be expected in PRETEN. the union sector than in the nonunion sector if a smaller wage increment is required to induce the desired internal mobility patterns where codified seniority rules are present.

### Union Effects on Returns to OJT: Training Model

The empirical estimates also confirm that, relative to their nonunion counterparts, white men who are covered by a collective bargaining agreement receive lower returns to OJT. Unions were expected to reduce employee returns to OJT by decreasing the proportion of OJT which individuals The altered financing was expected initially, finance. because the union wage effect will drive a larger wedge between the wage and the value of marginal product. In spite of lower employee returns to OJT, the greater share of unionized employer financing was expected to persist through time, because unions reduce quit rates. The significantly smaller OJT coefficient for unionized white men , relative to their nonunion counterparts, supports this expectation. (See Table 5-12.)

### Union Effects on Returns to POSTEN: Training Model

Collective bargaining coverage was expected to increase employee returns to POSTEN, <u>i.e.</u>, to tenure on the job obtained through promotion. This expectation was based on the hypothesis that codified seniority provisions will increase the probability of promotion for high tenure workers in the union sector. Promotion from within requires that incumbents receive sufficient firm-specific OJT to function efficiently in the new position. More union sector workers were expected to receive promotions and, as a consequence, receive more specific training than their nonunion counterparts. The significant t-ratio which compares the derivatives of the union and nonunion sector wage equations with respect to POSTEN supports this expectation. (See Table 5-12.)

The positive union effect on employee returns to POSTEN is particularly important because this finding contradicts the hypotheses found throughout the relevant literature. Prior researchers hypothesized that unions will reduce returns to all individual attributes, including all human capital.<sup>113</sup> Furthermore, no previous work, including Mincer's, has produced evidence that unions increase returns to any segment of current employer tenure. The absence of prior empirical support for the proposition that unions increase employee returns to any experience component is probably due to the use of total experience proxies in most previous work, and to the use of aggregated tenure measures in the few studies which have used direct experience measures. The finding of a positive and significant union/nonunion difference in the POSTEN coefficient supports the contention that union effects are more complex and varied than has been previously recognized. This finding importance of using direct also emphasizes the and disaggregated measures of current employer tenure to

<sup>&</sup>lt;sup>113</sup> An exception within this literature is Mincer's recent work on union effects on returns to human capital. See Mincer, "Union Wage Effects."

differentiate among the variety of union effects on internal labor market dynamics.

The raw data are consistent with the hypothesized union effects on labor allocation within internal labor markets for all race/sex groups. The supporting data are displayed in Table 5-13 below. Mobility within the firm is indicated by a positive value for PRETEN. On the basis of this measure, more union than nonunion workers have experienced internal mobility. A positive PRETEN value does not differentiate between promotions, as opposed to lateral or downward moves. In both the union and nonunion sectors, however, individuals who moved internally reported receiving more OJT than those who remained in their initial job. If being promoted increases the amount of OJT received, while lateral or downward movement does not, then mobility, as indicated by positive PRETEN, is upward.

All expectations regarding union effects on employee returns to the three tenure segments are strongly supported by the regression estimates for white men. The raw data concur with these expectations for all race/sex groups. However, the empirical results for the other race/sex groups fail to support these hypotheses. The lack of consistency in the results for the groups of women with white men is not of great concern, because the estimated union effects are not statistically significant for white and nonwhite women. For nonwhite men, however, unions significantly alter

## Table 5-13

Percentage of Individuals Who Have Experienced Internal Mobility with Their Current Employer<sup>1</sup>, and Average OJT for Internal Movers and Nonmovers, by Race, Sex, and Union Status

|       |          | WHITE<br>MEN | NONWHITE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|-------|----------|--------------|-----------------|----------------|-------------------|
|       | PE       | ERCENT OF    | WORKERS WITH    | POSITIVE PRET  | EN                |
| UNIO  | N        | 61.7         | 59.3            | 52.7           | 44.7              |
| NONUI | NION     | 48.8         | 41.0            | 32.7           | 33.6              |
|       | AVERAG   | E OJT FOR    | INDIVIDUALS     | WITH POSITIVE  | PRETEN            |
| UNIO  | N        | 1.41         | 0.64            | 0.43           | 0.38              |
| NONUI | NION     | 1.59         | 0.81            | 0.66           | 0.33              |
|       | AVER     | AGE OJT F    | OR INDIVIDUAL   | S WITH ZERO PI | RETEN             |
| UNIO  | N        | 0.85         | 0.51            | 0.29           | 0.24              |
| NONUI | NION     | 0.82         | 0.44            | 0.31           | 0.25              |
| 1 Int | ternal m | obility i    | s indicated b   | у              |                   |

a positive value for PRETEN.

employee returns to OJT. Furthermore, the direction of this union effect on nonwhite men's returns to OJT is contrary to expectations, and to the results for white men. (See Table 5-12.)

The apparently contradictory results for white and nonwhite men may be explained as follows: once individuals are assigned to jobs, collective bargaining coverage reduces discrimination. Unions were expected to reduce discrimination through their imposition of job rates. This expectation is supported by the finding that there is no significant difference in equation structure between white and nonwhite men in the union sector; whereas in the nonunion sector, the overall wage structures and the group of human capital coefficients differ significantly between white and nonwhite men.<sup>114</sup> It is important to separate union effects on employee returns to human capital per se, from union effects on racial wage differentials. Comparing the OJT coefficients and the derivatives of the wage equations with respect to PRETEN and POSTEN of nonwhite union men with those of white nonunion men is one way to accomplish this separation.<sup>115</sup> Returns to PRETEN differ significantly

<sup>114</sup> The F-ratios computed to test the equality of nonwhite and white men's human capital coefficients are 0.68 and 5.55 in the union and nonunion sectors, respectively.

<sup>115</sup> This procedure is justifiable because the F-tests indicate that wage determination does not differ between white and nonwhite men in the union sector. The t-statistics comparing the partials with respect to PRETEN, the OJT coefficients, and the partials with respect to POSTEN are -1.90, -0.30, and 0.26, between white nonunion and nonwhite union men, while returns to OJT and POSTEN do not. The direction of all differences are consistent with a priori expectations.

The preceding comparisons may be interpreted as indicating that unions reduce racial wage discrimination by equalizing returns to a given amount of human capital between white and nonwhite men. However, the nonsignificant differences in returns to OJT and POSTEN between white nonunion and nonwhite union men indicate that union effects on mobility within internal labor markets are not as clearly reflected in the wage determination process for nonwhite as for white men. The lack of strong empirical support for the hypothesized effects of unions on returns to OJT and POSTEN among nonwhite union sector men may be due to the inability to fully differentiate between union effects per se, and union effects on racial wage differentials. Alternatively, union effects on the returns which nonwhite men receive for OJT and POSTEN may differ from these union effects on white men's returns.

#### The Effect of Seniority Provisions on Returns to the Tenure Segments

The estimated coefficients of the SENINDEX-tenure segment interactions in the Training Model do not attain group significance for either white or nonwhite union sector men. (See Table 5-11.) The lack of empirical support for

respectively.

the differential effects of SENINDEX on returns to tenure in the Training Model is consistent with the results of the SENINDEX/Experience Model.

Strong seniority in promotion provisions were expected to reduce returns to tenure with the current employer. This expectation was based on the proposition that the more automatic the promotion decision, the smaller the wage increment required to induce the desired mobility within a unionized firm. That is, PRET\*SEN and POST\*SEN were expected to have negative effects on wages. In fact, these coefficients are not statistically significant, and the estimated direction of the effects of SENINDEX on employee returns to PRETEN and POSTEN differ between white and nonwhite union sector men. (see Table 5-10.) POSTEN refers to time in the job acquired when an individual is promoted, while PRETEN refers to the entry-level job. The expectation that the SENINDEX would reduce employee returns was. therefore, most applicable to POST\*SEN. To the extent that PRETEN does not capture the effect of internal mobility on wages, it is not suprising that the coefficient of PRET\*SEN is not statistically significant. However, the estimated effect of seniority provisions on returns to POSTEN is critical to the hypotheses being tested.

The lack of empirical support for the hypothesis that strong seniority provisions reduce employees' returns to POSTEN may be interpreted in a number of ways. Based on the

results reported herein, it must be concluded that seniority in promotion provisions have no effect on employee returns to current employer tenure. This conclusion is difficult to sustain, however, because the hypotheses concerning average union effects on returns to the tenure segments are strongly supported for white men, and were derived from expectations of the effects of seniority in promotion provisions on internal labor market mobility and training. Alternatively, the lack of empirical support may indicate that confounding influences are operative. One potentially confounding influence has already been identified: the existence of nonwage compensating differentials which may be associated with promotion in both the union and nonunion sectors. The nonsignificant SENINDEX coefficients may also indicate that the index contains substantial measurement error. The necessity to aggregate the BLS data to the one-digit industry level is one source of measurement error in the SENINDEX, which is of unknown magnitude. Finally, the small sample size may limit substantially the statistical power of the empirical model. When white and nonwhite union sector pooled and the SENINDEX/Training men are Model is estimated, 116 all SENINDEX-human capital interaction coefficients, as well as the group of SENINDEX-tenure coefficients, attain statistical significance. Furthermore,

<sup>&</sup>lt;sup>116</sup> When union sector men of both races were pooled for estimation, a binary variable denoting race was also included.

when union sector white and nonwhite men are pooled, the estimated direction of SENINDEX effects on employee returns to all tenure segments are as hypothesized.<sup>117</sup> Therefore, the inability to conclude that seniority provisions are the channel through which unions influence wages may result from the limited sample size. Notwithstanding these alternative explanations, the present analysis does not provide empirical support for the hypothesis that unions alter employee returns to PRETEN and POSTEN by means of codified seniority in promotion provisions. The empirical models be estimated using larger samples before firm must conclusions can be drawn.

The empirical results also fail to support the hypothesis that seniority provisions are the channel through which unions reduce employee returns to OJT. (See Table 5-10.) The union-induced reduction in returns to OJT was expected to result from union-negotiated wages, which drive a larger wedge between the wage and the value of marginal product. It was expected that unionized employers would enjoy greater latitude in OJT financing where there are strong seniority provisions, because seniority rules are one channel through which unions reduce employee-initiated quits. Smaller shares of employee financing and returns to OJT were expected to increase quit rates to unacceptable

<sup>&</sup>lt;sup>117</sup> See Appendix Tables A-3 and A-4 for the results of the SENINDEX/Training Model which pools white and nonwhite union sector men.

levels in the absence of union-induced quit reductions.

The alteration of OJT financing in the union sector should, however, depend on whether the strength of seniority provisions has an independent effect on wage rates. The relationship between the strength of seniority provisions and wages is largely an empirical question, since unions may choose to use their bargaining power to increase wages, to increase seniority protections, or to increase both. If there is a clear trade-off between seniority protections and wages, there would be no expectation that the strength of seniority provisions would be associated with reduced employee returns to OJT. Conversely, if unions with substantial bargaining power are able to increase both wages and the strength of seniority provisions, an association between SENINDEX and employee returns to OJT would be expected. When the group significance of all SENINDEX interactions was tested, all SENINDEX interaction coefficients were restricted to equal zero. This restricted equation estimated the independent effect of SENINDEX on wages. For white union men, the SENINDEX coefficient was -.0070 and was nonsignificant. For nonwhite men the SENINDEX was .015, and was statistically significant. In light of such mixed evidence, it is unclear how the SENINDEX Model results should be interpreted. Based on the analysis, it cannot be concluded that unions alter OJT financing through the strength of seniority in promotion provisions

negotiated by unions. The union-induced reduction in employee returns to OJT, verified for white men with the "pure" Training Model, does not vary with the strength of seniority in promotion provisions.

## Union Effects on Women's Wages

Having examined in some detail the empirical results it is necessary to examine the alternative for men, explanations for the paucity of evidence supporting the hypothesized union effects on women's wage determination. The most obvious explanation is that unions do not alter returns to women's human capital. Such a conclusion would be very difficult to accept on theoretical grounds. However, there is an important empirical difference in the industry distribution of union sector employment of men and women which may account for the inconsistent results between (See Tables A-1 and A-2 for the industry the sexes. distribution of employment by race, sex and union status.) Specifically, women in the union sector are, on average, industries--e.g., employed in services, retail, communications--where union bargaining power is relatively weak, whereas men predominate in durable manufacturing and transportation industries which are traditional strongholds Thus, the failure to find that unions of union power. significantly alter women's wage determination may reflect the absence of union bargaining power in the industries where unionized women are concentrated, rather than a true sex difference in union effects.

Alternatively, the very small sample sizes of women may be responsible for the limited empirical support of the hypotheses when the models are estimated using data on women. Depending on the empirical model, the largest sample size for unionized women is 141, and the smallest sample is 131. The number of independent variables which were used in the various model specifications ranges from 33 for the "pure" Experience Model to 44 for the SENINDEX/Training The latter model includes many interaction terms. Model. As a result of the large number of independent variables and the small sample sizes, the statistical power of the empirical models is quite limited. The small sample sizes are a direct consequence of the low rates of unionization Although other data sets contain among women. larger samples of women and union information, they lack the direct, detailed experience measures utilized in this analysis. Use of direct and detailed experience measures important for estimating union effects are on wage determination of men for the reasons set out in Chapters II Direct experience measures are of even greater and III. importance for women due to their less continuous work histories as compared with men.

A tradeoff exists between the data limitations of sample size and work experience information. Sample size was sacrificed for the ability to observe and disaggregate current employer tenure. By allowing the OJT received in
the entry-level job and in the job received through promotion to depend differentially on previous work experience, the Training Model produced the only statistically significant union effect estimate for white women. While the National Longitudinal Survey contains larger samples of women and direct experience measures, the data were collected for limited age groups. Because estimates of returns to experience, and particularly tenure, are likely to be sensitive to truncation by age, this alternative data source was not utilized.

## Control Variables

As discussed in the preceding chapter, two alternative sets of variables were utilized to control for the effect of prior labor force attachment on an individual's stock of The first set of controls consists of human capital. responses to direct questions concerning the number, length, and timing of spells out of the labor force. EDTOLFP measures the number of years between school completion and the first job; YRSOLF measures the number of years an individual was out of the labor force after the first post-school job; and PCTFT measures the proportion of prior work experience which was full-time. Tables 5-14 and 5-15 below report the estimated coefficients, standard errors and F-statistics on the group significance of this set of variables for union and nonunion sectors.

Estimated Coefficients<sup>1</sup> and F-Statistics on Group Significance, Control Variables for Time Out of the Labor Force for Men, by Race, Union Status, and Empirical Model

|                      | WHITE    | MEN      | NONWHITE MEN |          |
|----------------------|----------|----------|--------------|----------|
|                      | UNION    | NONUNION | UNION        | NONUNION |
| Experience<br>Model: |          |          |              |          |
| YRSOLF               | .0060    | .0069    | .0056        | 013      |
|                      | (.0078)  | (.0097)  | (.0109)      | (.010)   |
| YREDTOLFP            | 012      | 0034     | .0029        | .0071    |
|                      | (.009)   | (.0062)  | (.0064)      | (.0088)  |
| PCTFT                | .00061   | .0024**  | .00077       | .00052   |
|                      | (.00078) | (.0008)  | (.00096)     | (.00074) |
| <b>F-statistic</b>   | 1.18     | 3.57*    | 0.37         | 0.92     |
| Training<br>Model:   |          |          |              |          |
| YRSOLF               | .0048    | .0053    | .0048        | 019      |
|                      | (.0078)  | (.0096)  | (.0110)      | (.011)   |
| YREDTOLFP            | 014      | 0022     | .0056        | .0084    |
|                      | (.009)   | (.0061)  | (.0062)      | (.0088)  |
| PCTFT                | .00035   | .0026**  | .0010        | .00090   |
|                      | (.00078) | (.0008)  | (.0010)      | (.00078) |
| <b>F-statistic</b>   | 1.12     | 4.08**   | 0.73         | 1.80     |

\*\*significant at .01 level
\*significant at .05 level

Estimated Coefficients<sup>1</sup> and F-Statistics on Group Significance, Control Variables for Time Out of the the Labor Force for Women, by Race, Union Status, and Empirical Model

|                      | WHITE   | WOMEN     | NONWHITE WOMEN |          |
|----------------------|---------|-----------|----------------|----------|
|                      | UNION   | NONUNION  | UNION          | NONUNION |
| Experience<br>Model: |         |           |                |          |
| YRSOLF               | 0080    | 00090     | .0016          | 0060     |
|                      | (.0056  | (.00203)  | (.0116)        | (.0034)  |
| YREDTOLFP            | 0063    | 0018      | 0020           | 0022     |
|                      | (.0048) | (.0060)   | (.0041)        | (.0017)  |
| PCTFT                | 0025    | .00049    | 00080          | .0010**  |
|                      | (.0013) | (.00041)  | (.00115)       | (.0004)  |
| <b>F-statistic</b>   | 2.11    | 0.91      | 0.20           | 3.92**   |
| Training<br>Model:   |         |           |                |          |
| YRSOLF               | 0091    | .00099    | .0044          | 0056     |
|                      | (.0054) | (.00201)  | (.0118)        | (.0034)  |
| YREDTOLFP            | 0036    | 000015    | 0019           | 00012    |
|                      | (.0045  | (.001580) | (.0043)        | (.00178) |
| PCTFT                | .0020   | .00065    | 00026          | .0011**  |
|                      | (.0012) | (.00040)  | (.00118)       | (.0004)  |
| F-statistic          | 1.69    | 0.95      | 0.12           | 3.91**   |

\*\*significant at .01 level
\*significant at .05 level

The two measures of time out of the labor force were expected to exert a negative effect on wages. A11 interruptions in work experience should have a direct negative influence on the amount of OJT investment. Work interruptions reduce: the opportunity to obtain OJT; the amount of investment in OJT during work experience before an anticipated work interruption; and the time horizon over which returns from OJT investment can be received. The YREDTOLFP coefficient is negative for all groups of women, and the YRSOLF coefficient is negative for union and nonunion white women, although none of these coefficients statistically significant. The nonsignificant are coefficients of these variables may indicate that the direct measures of tenure with the current employer control for much of the atrophy and deferral of OJT investment which was expected to result from work interruptions. For half of the groups of men, the coefficients of these variables are positive, but none achieve statistical significance. The poor performance of these variables for men may be attributable to the the very short work interruptions most men experience. For all four race/union groups of men, the average values of YRSOLF and YREDTOLFP are less than one year. As with women, the direct experience measures may also control for the effect of work interruptions on OJT investment decisions.

The percentage of prior full-time work experience has the expected positive effect on wages for all race/sex/union status groups, except union sector women. However, PCTFT is statistically significant only for white men and nonwhite women in the nonunion sector. Full-time work experience was expected to influence the receipt of OJT from an individual decision-making perspective, and because there is little incentive for employers to provide or to finance the OJT of part-time workers.

The group of time out of the labor force coefficients restricted to zero. This procedure tests was the statistical significance of these variables as a group. The F-ratios, computed from these restrictions (for each race/sex/union status group) indicate that these variables do not contribute to the explanatory power of the empirical models in the union sector. The time out of the labor force variables are statistically significant as a group for white men and nonwhite women in the nonunion sector. The poor performance of these measures, both individually and as a group, may indicate that the direct measures of work experience control for the effect of previous labor force attachment. In addition, for the union sector groups, the nonsignificance of these control variables may indicate that unions equalize treatment of individuals by basing wages on characteristics, than individual job rather on characteristics, such as prior work history.

The alternative specification used to control for differences in labor force attachment consists of variables which are known to affect individual labor supply decisions. Tables 5-16 and 5-17 below report the coefficients of these control variables for men and women, respectively, using the Experience Model specification. Tables 5-18 and 5-19 report these results for men and women using the Training Model specification.

The estimated coefficients of the county unemployment rates (UE-1 - UE-5) are negative for the majority of union sector groups, as well as for nonunion sector women. Since these variables are indicators for low unemployment rate negative coefficients counties, their support the equilibrium model of wages and unemployment rates developed by Reza.<sup>118</sup> It would appear that these variables are capturing the effects of structural differences in labor markets, rather than individual differences in labor supply The mixed results of the unemployment rate per se. coefficients for nonunion sector men suggest that the unemployment rate variables may also be capturing the positive correlation between the density of union organization in the Northeast and Midwest and the higher than average unemployment rates of these regions.

<sup>&</sup>lt;sup>118</sup> Reza, "Geographical Differences in Earnings and Unemployment."

Estimated Coefficients<sup>1</sup> and F-Statistics on Group Significance, Control Variables for Determinants of Labor Supply for Men, by Race and Union Status, Experience Model

|                    | WHITE N                    | MEN           | NONWHIT     | E MEN     |  |  |
|--------------------|----------------------------|---------------|-------------|-----------|--|--|
|                    | UNION                      | NONUN I ON    | UNION       | NONUNION  |  |  |
| UE1                | 23*<br>(.09)               | .010<br>(164) |             |           |  |  |
| UE2                | 090                        | 100           | .099        | 098       |  |  |
|                    | (.050)                     | (.055)        | (.203)      | (.095)    |  |  |
| UE3                | 025                        | .017          | 12          | 058       |  |  |
|                    | (.040)                     | (.050)        | (.06)       | (.051)    |  |  |
| UE4                | .027                       | 0044          | 055         | .0042     |  |  |
|                    | (.033)                     | (.0470)       | (.048)      | (.0044)   |  |  |
| UE5                | .026                       | 022           | 081         | .042      |  |  |
|                    | (.045)                     | (.057)        | (.072)      | (.070)    |  |  |
| SPLABINC           | .00000019                  | .0000026      | .000040     | .000014*  |  |  |
|                    | (.00000020)                | (.000030)     | (.0000100)  | (.000006) |  |  |
| NONLABINC          | .0000079                   | 000016        | .00000093   | 000028    |  |  |
|                    | (.0000100)                 | (.000010)     | (.00002000) | (.000020) |  |  |
| CHILD              | .016                       | .051*         | .017        | 014       |  |  |
|                    | (.016)                     | (.023)        | (.022)      | (.018)    |  |  |
| <b>F-statistic</b> | 2.38*                      | 1.90          | 0.78        | 2.10*     |  |  |
| **significar       | **significant at .01 level |               |             |           |  |  |
| *significar        | *significant at .05 level  |               |             |           |  |  |

Estimated Coefficients<sup>1</sup> and F-Statistics on Group Significance, Control Variables for Determinants of Labor Supply for Women, by Race and Union Status, Experience Model

|              | WHITE WO      | OMEN        | NONWHITE   | E WOMEN    |
|--------------|---------------|-------------|------------|------------|
|              | UNION         | NONUNION    | UNION      | NONUNION   |
|              |               |             |            |            |
| UE1          | 48*           | 086         |            |            |
|              | (.19)         | (.121)      |            |            |
| UE2          | 02            | 085         |            | 062        |
|              | (.11)         | (.043)      |            | (.085)     |
| UE3          | 15            | 031         | 14         | 043        |
|              | (.09)         | (.038)      | (.09)      | (.044)     |
| UE4          | .028          | 046         | 084        | 014        |
|              | (.077)        | (.034)      | (.067)     | (.039)     |
| UE5          | .050          | 092*        | .071       | 0097       |
|              | (.083)        | (.042)      | (.090)     | (.0510)    |
| SPLABINC     | .0000091*     | .0000023    | .0000036   | .0000050*  |
|              | (.000040)     | (.0000030)  | (.0000030) | (.0000020) |
| NONLABINC    | 000016        | 00000075    | .000014    | .0000052   |
|              | (             | (.00000208) | (.000020)  | (.0000100) |
| CHILD        | .089          | .035        | .0092      | .026       |
|              | (.049)        | (.020)      | (.0359)    | (.01/)     |
| F-statistic  | 2.78**        | 1.68        | 1.16       | 1.29       |
| **significar | nt at .01 lev | vel         |            |            |

\*significant at .05 level

Estimated Coefficients<sup>1</sup> and F-Statistics on Group Significance, Control Variables for Determinants of Labor Supply for Men, by Race and Union Status, Training Model

|                             | WHITE N                        | IEN            | NONWHITE   | MEN        |
|-----------------------------|--------------------------------|----------------|------------|------------|
|                             | UNION                          | NONUN I ON     | UNION      | NONUN I ON |
| UE1                         | 25**<br>(.09)                  | .038<br>(.162) |            |            |
| UE2                         | 090                            | 062            | .0060      | .042       |
|                             | (.046)                         | (.055)         | (.2015)    | (.104)     |
| UE3                         | .021                           | .051           | 097        | 050        |
|                             | (.039)                         | (.050)         | (.066)     | (.053)     |
| UE4                         | .022                           | .024           | 039        | .011       |
|                             | (.033)                         | (.047)         | (.049)     | (.046)     |
| UE5                         | .036                           | .027           | 088        | .058       |
|                             | (.044)                         | (.057)         | (.071)     | (.073)     |
| SPLABINC                    | 00000038                       | .0000018       | .0000062   | .000015**  |
|                             | (.00000400)                    | (.0000030)     | (.0000100) | (.000005)  |
| NONLABINC                   | 00000019                       | 000019         | .0000038   | 000038     |
|                             | (.00001000)                    | (.000010)      | (.0000200) | (.000020)  |
| CHILD                       | .015                           | .054*          | .013       | 0078       |
|                             | (.016)                         | (.021)         | (.022)     | (.0185)    |
| F-statistic                 | 2.11*                          | 1.97*          | 0.71       | 2.25*      |
| **significan<br>*significan | nt at .01 lev<br>nt at .05 lev | vel<br>vel     |            |            |

Estimated Coefficients<sup>1</sup> and F-Statistics on Group Significance, Control Variables for Determinants of Labor Supply for Women, by Race and Union Status, Training Model

|              | WHITE W                    | OMEN          | NONWHITE WOMEN |               |  |
|--------------|----------------------------|---------------|----------------|---------------|--|
|              | UNION                      | NONUNION      | UNION          | NONUNION      |  |
|              |                            |               |                |               |  |
| UE1          | 37*<br>(.181)              | 073<br>(.118) |                |               |  |
| UE2          | .042<br>(.104)             | 066<br>(.043) |                | 023<br>(.085) |  |
| UE3          | 12                         | 026           | 15             | 029           |  |
|              | (.09)                      | (.037)        | (.09)          | (.044)        |  |
| UE4          | .014                       | 037           | 09             | 012           |  |
|              | (.072)                     | (.033)        | (.07)          | (.039)        |  |
| UE5          | .053                       | 10*           | .058           | 011           |  |
|              | (.083)                     | (.04)         | (.092)         | (.051)        |  |
| SPLABINC     | .0000075*                  | .0000018      | .0000045       | .0000043      |  |
|              | (.0000035)                 | (.0000013)    | (.0000048)     | (.0000030)    |  |
| NONLABINC    | 000017                     | .0000011      | .000015        | .0000052      |  |
|              | (.000010)                  | (.0000040)    | (.000020)      | (.0000100)    |  |
| CHILD        | .096*                      | .035          | .0078          | .016          |  |
|              | (.048)                     | (.019)        | (.0369)        | (.017)        |  |
| F-statistic  | 2.45                       | 1.54          | 1.12           | 0.72          |  |
| **significa: | **significant at .01 level |               |                |               |  |
| *significa:  | *significant at .05 level  |               |                |               |  |

As hypothesized, spouse's labor income (SPLABINC) has a positive effect on wages for all race/sex/union status groups, except for union sector white men in the Training This coefficient attains statistical significance Model. for white women in the union sector, and nonwhite men and women in the nonunion sector. The negative coefficient for union sector white men is not statistically significant. The estimated coefficients of nonlabor income (NONLABINC) vary in sign across race/sex groups, but none are statistically significant. The expectation that SPLABINC and NONLABINC would have positive effects on wages follows directly from the income effect on labor force participation. An unknown proportion of reported nonlabor income may be transitory, and thus, will not influence labor supply or wage acceptance decisions. The inclusion of transitory income in nonlabor income may account for the nonsignificant NONLABINC coefficients.

The coefficient of the number of children under six years old (CHILD) is significant for white union sector women and white nonunion men only. CHILD is positive for all groups except nonwhite nonunion sector men. CHILD was expected to have a positive effect on wage acceptance decisions of women, because the number of young children should proxy for the shadow value of home time. For men, CHILD was expected to increase the wage accepted because it should proxy for the greater income needs of a family with dependents. Similarly, the presence of young children was expected to reduce other household income, because wives with young children are less likely to work outside the home.

F-statistics were calculated to test whether the group of labor supply determinants contribute significantly to the explanatory power of the models. These F-tests indicate that this group of variables significantly increases the explanatory power of the "pure" Experience and Training Models for both white men and women in the union sector. The group of labor supply determinates are significant in the Experience Model only for nonwhite nonunion men, and in the Training Model only for white nonunion women.

Comparing the F-tests on the group of time out of the labor force variables with the F-tests on the group of labor supply determinants, indicates that the latter group is more important for the union sector. The time out of the labor force group performs slightly better than does the labor supply group for the nonunion sector. Because the major purpose of this study is to examine union effects on wage determination, the empirical estimates reported in this Chapter are based on equations which utilize the labor supply control variables. The choice of controls produces only marginal changes in the estimates of the "pure" models. For the SENINDEX Models, however, the group significance of the human capital- seniority index interactions is reduced

by using the labor supply controls. The results of all models using the time out of the labor force controls are reported in Appendix A.

Table 5-20 reports the estimates of the remaining control variables for men, and Table 5-21 contains the same information for women. The results for the region, industry and occupation control variables are reported, but will not be discussed. In general, these coefficients conform to what would be expected in relation to their omitted reference categories of South, nondurable manufacturing, and operatives, respectively. The variable indicating that the presently held job is full-time (FT) is positive, as expected, for all groups except nonunion nonwhite men. The negative FT coefficient for the latter group is not statistically significant, however. The FT coefficients are significant for all groups of white women, but only for nonunion white men. Residence in an urban area is also positive, as expected, due to the higher cost of living and the more educated labor supply available in these areas.

|             | WHITE              | E MEN    | NONWHITE MEN |          |
|-------------|--------------------|----------|--------------|----------|
|             | UNION              | NONUNION | UNION        | NONUNION |
| FT          | .11                | .24**    | .049         | 13       |
|             | (.09)              | (.07)    | (.071)       | (.07)    |
| SMSA        | .074**             | .13**    | .15**        | .12**    |
|             | (.027)             | (.03)    | (.05)        | (.03)    |
| Region:     | .038               | .097     | .11*         | .14*     |
| EAST        | (.036)             | (.040)   | (.05)        | (.04)    |
| CENT        | .14**              | .13**    | .099*        | .22*     |
|             | (.03)              | (.04)    | (.048)       | (.06)    |
| WEST        | .19**              | .16**    | .20**        | .053     |
|             | (.05)              | (.05)    | (.07)        | (.060)   |
| Occupation: | 071                | .12*     | 065          | .065     |
| CLER        | (.049)             | (.05)    | (.063)       | (.059)   |
| SALES       | 29**               | .17**    | 24*          | 0012     |
|             | (.10)              | (.06)    | (.12)        | (.1153)  |
| CRAFTS      | .069*              | .22**    | .053         | .16**    |
|             | (.026)             | (.04)    | (.051)       | (.04)    |
| LABOR       | 062                | 064      | 066          | 076      |
|             | (.054)             | (.065)   | (.053)       | (.041)   |
| SERV        | <del>-</del> .18** | 10       | 20**         | 12*      |
|             | (.07)              | (.06)    | (.07)        | (.05)    |

Estimated Coefficients,<sup>1</sup> Other Control Variables for Men, by Race and Union Status, "Pure" Experience Model

| WHITE   | MEN                                                                                                                                                                                                              | NONWHITE MEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNION   | NONUNION                                                                                                                                                                                                         | UNION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NONUNION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|         |                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| .38**   | .095                                                                                                                                                                                                             | 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | .27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (.07)   | (.113)                                                                                                                                                                                                           | (.28)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (.15)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 012     | .08 <b>4</b>                                                                                                                                                                                                     | 013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (.034)  | (.050)                                                                                                                                                                                                           | (.051)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (.045)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| .32**   | .097                                                                                                                                                                                                             | .29**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | .000082                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (.05)   | (.057)                                                                                                                                                                                                           | (.07)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (.050320)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| .11*    | .16*                                                                                                                                                                                                             | .24**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | .22**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| (.04)   | (.06)                                                                                                                                                                                                            | (.06)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (.05)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| .081    | .42**                                                                                                                                                                                                            | .027                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | .13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (.073)  | (.15)                                                                                                                                                                                                            | (.113)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (.16)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| .18**   | .30**                                                                                                                                                                                                            | .12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (.06)   | (.09)                                                                                                                                                                                                            | (.08)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (.08)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| .15*    | 079                                                                                                                                                                                                              | .097                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 22**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (.07)   | (.056)                                                                                                                                                                                                           | (.089)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (.05)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| .053    | .077                                                                                                                                                                                                             | 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (.095)  | (.080)                                                                                                                                                                                                           | (.13)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (.07)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 0052    | .14                                                                                                                                                                                                              | .089                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| (.1754) | (.08)                                                                                                                                                                                                            | (.207)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (.07)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 031     | 10                                                                                                                                                                                                               | 025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (.060)  | (.06)                                                                                                                                                                                                            | (.084)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (.06)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 064     | 048                                                                                                                                                                                                              | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| (.086)  | (.081)                                                                                                                                                                                                           | (.10)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (.06)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|         | WHITE<br>UNION<br>.38**<br>(.07)<br>012<br>(.034)<br>.32**<br>(.05)<br>.11*<br>(.04)<br>.081<br>(.073)<br>.18**<br>(.06)<br>.15*<br>(.07)<br>.053<br>(.095)<br>0052<br>(.1754)<br>031<br>(.060)<br>064<br>(.086) | WHITE MEN<br>NONUNION           .38**         .095           (.07)         (.113)          012         .084           (.034)         (.050)           .32**         .097           (.05)         (.057)           .11*         .16*           (.04)         (.06)           .081         .42**           (.073)         (.15)           .18**         .30**           (.06)         (.09)           .15*        079           (.07)         (.056)           .053         .077           (.095)         (.080)          0052         .14           (.1754)         (.08)          031        10           (.060)         (.06) | WHITE MEN<br>UNIONNONUNIONNONWH<br>UNION.38**.095<br>(.07) $22$<br>(.07)(.07)(.113)(.28)012.084<br>(.050) $013$<br>(.051).32**.097<br>(.05).29**<br>(.057)(.05)(.057)(.07).11*.16*<br>(.06).24**<br>(.06).081.42**<br>(.073).027<br>(.15).18**.30**<br>(.13).12<br>(.06).061(.09)<br>(.08)(.08)<br>(.089).15*<br>(.07).077<br>(.056).13<br>(.089).053<br>(.077).077<br>(.080).13)0052<br>(.074).14<br>(.08).089<br>(.207).031<br>(.060)10<br>(.084)025<br>(.084)064<br>(.081)025<br>(.10) |

# Table 5-20 (cont'd.)

\*\*significant at .01 level
\*significant at .05 level

|             | WHITE WOMEN |               | NONWHITE WOMEN |               |
|-------------|-------------|---------------|----------------|---------------|
|             | UNION       | NONUNION      | UNION          | NONUNION      |
| FT          | .25*        | .099**        | .16*           | .083**        |
|             | (.10)       | (.025)        | (.07)          | (.029)        |
| SMSA        | .073        | .11**         | .12            | .13**         |
|             | (.067)      | (.02)         | (.09)          | (.03)         |
| Region:     | .17         | .079*         | .15*           | .14**         |
| EAST        | (.10)       | (.032)        | (.07)          | (.03)         |
| CENT        | .26**       | .056          | .089           | .047          |
|             | (.09)       | (.029)        | (.072)         | (.040)        |
| WEST        | .19         | .065          | .037           | .14**         |
|             | (.11)       | (.037)        | (.095)         | (.05)         |
| Occupation: | .11         | .095*         | 064            | .12*          |
| CLER        | (.11)       | (.042)        | (.092)         | (.06)         |
| SALES       | .15         | .068          | 18             | .080          |
|             | (.18)       | (.057)        | (.18)          | (.092)        |
| CRAFTS      | .12         | .097          | .079           | .37**         |
|             | (.14)       | (.088)        | (.121)         | (.10)         |
| LABOR       |             | 056<br>(.124) | .092<br>(.210) | 017<br>(.125) |
| SERV        | 13          | 10*           | 11             | 016           |
|             | (.13)       | (.05)         | (.08)          | (.055)        |

Estimated Coefficients<sup>1</sup>, Other Control Variables for Women, by Race and Union Status, "Pure" Experience Model

|                     | WHITE            | WOMEN                   | NONWHITE WOMEN |                        |
|---------------------|------------------|-------------------------|----------------|------------------------|
|                     | UNION            | NONUNION                | UNION          | NONUNION               |
| Industry:<br>MINING |                  | .44                     |                | .28                    |
| DURMFG              | .041<br>(.071)   | (.28)<br>.14**<br>(.05) | .12<br>(.08)   | (.23)<br>.14*<br>(.06) |
| CONST               |                  | .13<br>(.09)            |                | 47<br>(.26)            |
| TRANS               | .30              | 087                     | .41            | .21                    |
|                     | (.21)            | (.106)                  | (.30)          | (.14)                  |
| COMM                | .035             | .33**                   | .47**          | 033                    |
|                     | (.129)           | (.11)                   | (.15)          | (.155)                 |
| OTRPUBUT            | .0051<br>(.3009) | .18<br>(.17)            |                | .32<br>(.18)           |
| RETAIL              | 063              | 20**                    | .13            | 17**                   |
|                     | (.149)           | (.05)                   | (.11)          | (.06)                  |
| WHOLESALE           | .13              | .056                    | 12             | .073                   |
|                     | (.23)            | (.081)                  | (.16)          | (.128)                 |
| FININRE             | 31               | 027                     | .41            | 054                    |
|                     | (.32)            | (.051)                  | (.21)          | (.071)                 |
| RBPAP               | 12               | 12*                     | .042           | 18**                   |
|                     | (.16)            | (.05)                   | (.107)         | (.06)                  |
| HEPSERV             | .043             | .056                    | .11            | 060                    |
|                     | (.139)           | (.047)                  | (.10)          | (.058)                 |

# Table 5-21 (cont'd.)

\*\*significant at .01 level
\*significant at .05 level

# Evaluating the Performance of Different Model Specifications

The "pure" Experience Model, the "pure" Training Model, and the SENINDEX Models must be evaluated using the two criteria set forth at the beginning of this chapter. The first criterion is the extent to which the Training Model and the SENINDEX Models contribute to an understanding of the channels of union influence on wages, relative to the "pure" Experience Model. The second criterion is the increase in the statistical explanatory power of the "pure" Training and SENINDEX Models relative to the more commonly used "pure" Experience Model.

A comparison of the "pure" Training Model estimates across union and nonunion sectors suggests that, on average, unions do have opposing effects on the tenure segments. Specifically, unions significantly reduce returns to PRETEN and OJT, and increase returns to POSTEN for white union men. The results are suggestive of the same effect for nonwhite union men, but are not conclusive. Still, the Training Model estimates can be considered an improvement over the estimates obtained using the "pure" Experience Model. This judgment is based on the results of the Experience Model, which suggest that unions reduce returns to total tenure--a conclusion which had to be modified, given the Training Model estimates. In light of the very broad generalizations found in the literature, suggesting that unions reduce returns to all wage determining attributes, a model

specification which provides strong evidence that this may indeed not be true, even if only for white men, contributes to an understanding of union effects on wage determination. The "pure" Training Model provides such evidence.

The SENINDEX Models provide necessary information for interpreting the empirical results. They indicate that seniority in promotion provisions are one channel through which unions influence returns to previous work experience. By doing so, the SENINDEX Models give empirical support to the previously untested proposition that the institutional effects of unions can have direct consequences for wage The SENINDEX is a very blunt measure, determination. because it was aggregated to the one-digit industry level. Perhaps as a consequence, the SENINDEX Model estimates do not support the hypothesized effects of seniority provisions on employee returns to tenure. The SENINDEX Models also provide a necessary check on the proper interpretation of the "pure" models. This was most clearly demonstrated by the PREV coefficients. The nonsignificant union/nonunion difference in returns to PREV which was estimated by the "pure" Experience Model would have forced the conclusion that unions do not alter employee returns to PREV in the the SENINDEX estimates. absence of However, this interpretation could not be sustained for nonwhite men because of the SENINDEX/Experience results. Other interpretations then had to be explored. The Training and

SENINDEX Models are successful in contributing to an understanding of union effects, albeit to a lesser extent than had been anticipated for the SENINDEX Models.

The second criterion is the increased explanatory power of the Training Model relative to the Experience Model. (See Table 5-22 below for a tabular comparison of the adjusted R<sup>2</sup>s.) Using this statistical criterion, the "pure" Training Model is an improvement over the "pure" Experience Model for six of the eight race/sex/union status groups. The greatest increase in the explanatory power of the "pure" Training Model, relative to the "pure" Experience Model, is 11.3 percent for white union sector women. The greatest reduction is 21.6 percent for nonwhite union women. In the majority of cases, the increased explanatory power of the "pure" Training Model, as compared with the "pure" Experience Model, is marginal. Using the criterion of the increased explanatory power of the Training Model, this specification performs better in the union sector than in the nonunion sector.

The performance of the SENINDEX Models, relative to the "pure" Models, is also mixed, on the basis of this statistical criterion. The greatest improvement in explanatory power of the SENINDEX Models is for white union sector women. The adjusted R<sup>2</sup> increases 20.1 and 15.3 percent for the SENINDEX/Experience and SENINEX/Training Models relative to the "pure" models for this group. That

Comparison of the Explanatory Power of the Various Model Specifications, by Race, Sex, and Union Status

|                                  | WHITE<br>MEN | NONWHITE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|----------------------------------|--------------|-----------------|----------------|-------------------|
|                                  |              | UNION SECTOR    | R              |                   |
| "Pure"<br>Experience<br>Model    | .385         | .310            | . 293          | .264              |
| "Pure"<br>Training<br>Model      | . 404        | .335            | .326           | .217              |
| SENINDEX/<br>Experience<br>Model | .379         | .325            | .352           | .216              |
| SENINDEX/<br>Training<br>Model   | . 411        | . 359           | .376           | .157              |
|                                  |              | NONUNION SECT   | OR             |                   |
| "Pure"<br>Experience<br>Model    | . 458        | . 408           | .383           | .412              |
| "Pure"<br>Training<br>Model      | . 477        | . 397           | . 399          | . 416             |

the SENINDEX Models improve most for white women is somewhat surprising, given the nonsignificant SENINDEX coefficient estimates for this demographic group. The improved explanatory power of the SENINDEX Models for white women may indicate that the limited sample size is responsible for the disappointing performance of the SENINDEX Models. Only for nonwhite women do the SENINDEX specifications perform worse than the "pure" model specifications.

#### CHAPTER VI

#### SUMMARY AND CONCLUSIONS

In this dissertation, hypotheses were developed to predict the channels through which unions alter the acquisition of and employee returns to human capital By identifying the channels of union investments. influence, the direction of union effects on returns to human capital were hypothesized. An index of the strength seniority in promotion provisions (SENINDEX) of was constructed. It was utilized in the empirical analyses to test the proposition that unions exert their influence on wage determination by means of codified seniority rules. The institutional literature about unions and neoclassical theory were the sources of these predictions. A data set (the PSID), which contains detailed, direct measures of work experience, and a full age range, was used for empirical testing.

Multiple regression analysis was used to estimate average union/nonunion differences, and the effect of the strength of seniority provisions within the union sector, on employee returns to education, previous experience, and tenure with the present employer. Total current employer tenure was disaggregated into three components in order to

distinguish between union effects on employee returns to time in the initial position, on-the-job training, and tenure on the job following promotion. The empirical specification which utilized the measure of total current employer tenure was referred to as the Experience Model. The specification which disaggregated total tenure was referred to as the Training Model.

The results of both models for white men supported the proposition that unions reduce returns to education, relative to the nonunion sector. The hypothesis that unions reduce employee returns to general human capital, including to education, was returns based on the following considerations: Unionized employers were expected to increase hiring standards in response to the use of seniority for promotion decisions; while the increased prevalence of single job rates in the union sector was predicted to reduce employers' ability to pay differential wages to individuals who perform the same job.

Contrary to expectations, and to the results for white men, collective bargaining coverage was not found to significantly alter returns to education for nonwhite men. The racial difference in union effects on returns to education was interpreted as reflecting the union-induced reduction in management's ability to base wages on individual characteristics. The education coefficients in the nonunion equations differed significantly between white and nonwhite men, but these coefficients were equal for white and nonwhite union sector men. This racial difference in union effects helps to explain previous research findings that unions increase the wages of nonwhite men more than any other demographic group. It also suggests that union sector employers are more constrained than nonunion sector employers in their ability to discriminate by race in wage-setting.

The estimated effect of unions on employee returns to previous experience differed across race/sex groups and model specifications. Collective bargaining coverage was found to significantly reduce average employee returns to previous experience only for white women, and only using the Training Model specification. The estimated union/nonunion difference in returns to previous experience was not statistically significant for nonwhite men, using the "pure" Experience and the "pure" Training Models. The results of the SENINDEX Models, however, provided evidence that, as the strength of seniority in promotion provisions increases, nonwhite men's returns to previous experience are progressively reduced.

The apparent contradiction between the results of the "pure" models and the SENINDEX Models was resolved by proposing that union sector hiring standards, in terms of related previous experience, may be raised to a greater extent, as the strength of seniority in promotion provisions

increases. The relationship between increased hiring standards for related previous experience and the strength of seniority provisions was expected to result from the greater screening costs which may be incurred to determine whether an individual's prior job involved highly similar work and skills. Such additional costs must be warranted by the increased probability of promoting a less qualified worker which strong seniority in promotion provisons would cause.

This study's most important contribution to the union wage literature is the estimation of union effects on employee returns to tenure with the current employer. The Training Model, which disaggregated total tenure into its three components, was expected to disentangle the complex effects of unions on employee returns to the tenure segments. Because such union effects are highly disputed among economists, the Training Model results enhance the understanding of how unions accomplish their well-documented net effects. The results of the Experience Model alone would have led to the conclusion that collective bargaining coverage uniformly reduces employee returns to current employer tenure. The positive union/nonunion difference in the time at which the wage-tenure profiles peaked suggested, however, that opposing effects might be present. The estimates of the Training Model for white union sector men strongly supported the hypotheses tested. Specifically,

while collective bargaining coverage was found to reduce employee returns to time in the initial position and to on-the-job training, the hypothesis that unions increase employee returns to tenure on the job received through promotion was also supported. The finding that unions increase returns to any component of tenure with the current employer is important for a number of reasons. It contradicts the broad generalizations concerning union wage effects in virtually all of the existing literature. It contradicts interpretations given to the findings of empirical studies which used various proxies for total work experience. It supports, albeit indirectly, the hypothesis that, by tying promotion and layoff probabilities to length of service, seniority rules are a channel through which unions exert their influence.

While recognizing this study's contribution to an understanding of what unions do and how they do it, the analysis was also subject to a number of limitations. One limitation was that the estimated union effects differed across demographic groups. The differences in estimated effects between white and nonwhite men could be reconciled by referring to the broader framework within which the hypotheses were developed. However, few conclusions could be drawn, based on the results, regarding union effects on wage determination among women; thereby obstructing the attempt to move toward a coherent theory of the economic

effects of collective bargaining. The absence of empirical support for the hypotheses when data on women were used may have resulted from sample size limitations. That limited sample size alone was responsible for the inability to draw generalized conclusions from the empirical results is, however, neither verifiable with presently available data, nor a substitute for the evidence required.

The performance of the SENINDEX Models also fell short of expectations. On the basis of the estimates by race and sex, evidence that seniority in promotion provisions are the channel through which collective bargaining affects wages was obtained only for nonwhite men, and only regarding previous experience. Because the knowledge of seniority rules played a pivotal role in the development of the hypotheses, stronger empirical verification of the channels of union effects would have been valuable. This lack of strong empirical support may also have resulted from sample size limitations. This explanation is supported by the statistical significance of results obtained by pooling white and nonwhite union sector men, and is further indicated by the substantial increase in the explanatory power of the SENINDEX Models, relative to the "pure" models, for white women. The indications noted above do not, however, constitute evidence upon which firm conclusions can be based.

Notwithstanding the above limitations, the findings of this study indirectly support and extend the growing literature investigating union reductions in employee quit rates. Collective bargaining coverage was expected to increase tenure with the current employer. This increase in tenure, in the presence of codified seniority rules governing promotion and layoff, was expected to cause higher average rates of promotion within the union sector. Because more firm-specific OJT is required as individuals progress up internal job ladders, collective bargaining coverage was also expected to increase the amount of firm-specific OJT which bargaining unit members receive. The raw data used in this study lend support to all these expectations.

The indications provided by the raw data are consistent with the regression results reported in this dissertation. However, the above propositions require empirical testing for verification. Prior empirical work examining union effects on OJT has not used data which decompose the total tenure measure.<sup>119</sup> Yet the union-induced increase in OJT hypothesized here is subject to an important qualification: it is contingent on receipt of a promotion. Thus, one possible direction for future research is to empirically test union effects on: individual promotion chances during tenure with an employer, the amount of OJT received in

<sup>&</sup>lt;sup>119</sup> Use of total tenure measures in prior work may account for findings that unions reduce the amount of OJT provided.

entry-level jobs, and the amount of OJT received on subsequent jobs with an employer. Such an analysis would help to resolve the controversy among economists concerning union effects on internal labor mobility and training.

Another important area for future research is to determine whether the union effects discussed in this study differ by sex. Because the results of the present study did not produce statistically significant estimates of union effects among women, it was not possible to pursue this question. Such research will require larger samples of women, and direct, detailed experience measures, such as those contained in the PSID. At minimum, such an analysis will provide information on whether sample size limitations, the differential industry distribution of employment among women, or a variety of alternative explanations, account for this study's inability to draw generalized conclusions from the findings for white and nonwhite men. Information on sex differences in union effects would also provide important public policy implications regarding working women, and guidance to the labor movement.

APPENDIX

| Tal | ble | A- | 1 |
|-----|-----|----|---|
|-----|-----|----|---|

Mean Values of All Independent Variables Used in the Regression Analyses for Men, by Race and Union Status

Acres 1

|                   | WHITE MEN |          | NONWHITE MEN |          |
|-------------------|-----------|----------|--------------|----------|
|                   | UNION     | NONUNION | UNION        | NONUNION |
| ED                | 11.091    | 11.533   | 10.181       | 9.381    |
| PREV              | 9.597     | 10.011   | 9.614        | 11.370   |
| PREV <sup>2</sup> | 183.280   | 199.419  | 171.875      | 240.995  |
| TEN               | 10.343    | 6.742    | 8.349        | 6.652    |
| TEN <sup>2</sup>  | 195.538   | 107.045  | 130.129      | 92.960   |
| PREV*TEN          | 82.592    | 61.894   | 78.264       | 76.018   |
| PRETEN            | 5.924     | 3.496    | 4.142        | 2.575    |
| OJT               | 1.208     | 1.201    | 0.591        | 0.584    |
| POSTEN            | 3.202     | 2.075    | 3.656        | 3.550    |
| PREV*PRET         | 40.571    | 26.022   | 35.499       | 25.132   |
| PREV*POST         | 28.451    | 23.490   | 37.904       | 45.192   |
| SENINDEX          | 10.124    |          | 9.524        |          |
| FT                | 0.985     | 0.962    | 0.949        | 0.952    |
| SMSA              | 0.674     | 0.619    | 0.855        | 0.671    |
| EAST              | 0.280     | 0.240    | 0.199        | 0.180    |
| CENT              | 0.389     | 0.264    | 0.297        | 0.052    |
| WEST              | 0.146     | 0.162    | 0.139        | 0.065    |
| CLER              | 0.065     | 0.104    | 0.082        | 0.063    |
| SALES             | 0.015     | 0.100    | 0.035        | 0.018    |
| CRAFTS            | 0.398     | 0.427    | 0.186        | 0.227    |
| LABOR             | 0.056     | 0.061    | 0.161        | 0.153    |
| SERV              | 0.045     | 0.063    | 0.110        | 0.178    |

|           | WHI      | WHITE MEN |          | NONWHITE MEN |  |
|-----------|----------|-----------|----------|--------------|--|
|           | UNION    | NONUNION  | UNION    | NONUNION     |  |
| MINING    | 0.032    | 0.015     | 0.003    | 0.007        |  |
| DURMFG    | 0.419    | 0.226     | 0.297    | 0.180        |  |
| CONST     | 0.086    | 0.156     | 0.136    | 0.153        |  |
| TRANS     | 0.101    | 0.078     | 0.114    | 0.086        |  |
| COMM      | 0.028    | 0.009     | 0.022    | 0.007        |  |
| OTRPUBUT  | 0.043    | 0.031     | 0.047    | 0.032        |  |
| RETAIL    | 0.037    | 0.138     | 0.063    | 0.108        |  |
| WHOLESAL  | 0.015    | 0.041     | 0.019    | 0.043        |  |
| FININRE   | 0.004    | 0.043     | 0.006    | 0.047        |  |
| RBPAP     | 0.043    | 0.104     | 0.063    | 0.090        |  |
| HEPSERV   | 0.028    | 0.039     | 0.047    | 0.099        |  |
| YRSOLF    | 0.908    | 0.846     | 0.660    | 0.423        |  |
| YREDTLFP  | 0.339    | 0.490     | 0.920    | 0.574        |  |
| PCTFT     | 94.713   | 90.886    | 91.720   | 91.416       |  |
| CHILD1    | 0.428    | 0.430     | 0.574    | 0.545        |  |
| SPINC     | 2,522.44 | 2,453.40  | 2,457.80 | 1,852.98     |  |
| NONLABINC | 716.63   | 794.75    | 480.69   | 356.66       |  |
| UE1       | 0.019    | 0.007     | 0.0      | 0.0          |  |
| UE2       | 0.125    | 0.142     | 0.006    | 0.023        |  |
| UE3       | 0.184    | 0.256     | 0.117    | 0.227        |  |
| UE4       | 0.378    | 0.355     | 0.563    | 0.574        |  |
| UE5       | 0.123    | 0.125     | 0.111    | 0.061        |  |

# Table A-2

Mean Values of All Independent Variables Used in the Regression Analyses for Women, by Race and Union Status

|                   | WHITE WOMEN |          | NONWHITE WOMEN |          |
|-------------------|-------------|----------|----------------|----------|
|                   | UNION       | NONUNION | UNION          | NONUNION |
| ED                | 11.380      | 11.987   | 10.789         | 10.630   |
| PREV              | 6.427       | 7.193    | 8.685          | 8.927    |
| PREV <sup>2</sup> | 81.659      | 107.334  | 110.529        | 114.450  |
| TEN               | 7.914       | 4.305    | 5.827          | 4.791    |
| TEN <sup>2</sup>  | 111.263     | 42.428   | 41.517         | 23.463   |
| PREV*TEN          | 43.157      | 40.785   | 27.846         | 3.193    |
| PRETEN            | 4.087       | 1.550    | 2.029          | 1.526    |
| OJT               | 0.365       | 0.420    | 0.229          | 0.275    |
| POSTEN            | 3.462       | 2.334    | 3.472          | 2.979    |
| PREV*PRET         | 23.895      | 10.716   | 24.969         | 12.194   |
| PREV*POST         | 23.959      | 18.987   | 32.796         | 30.748   |
| SENINDEX          | 9.613       |          | 10.248         |          |
| FT                | 0.896       | 0.740    | 0.852          | 0.763    |
| SMSA              | 0.720       | 0.665    | 0.876          | 0.738    |
| EAST              | 0.353       | 0.240    | 0.286          | 0.170    |
| CENT              | 0.360       | 0.306    | 0.280          | 0.096    |
| WEST              | 0.140       | 0.198    | 0.137          | 0.087    |
| CLER              | 0.353       | 0.484    | 0.230          | 0.237    |
| SALES             | 0.027       | 0.081    | 0.019          | 0.025    |
| CRAFTS            | 0.027       | 0.015    | 0.037          | 0.014    |
| LABOR             | 0.0         | 0.009    | 0.012          | 0.009    |
| SERV              | 0.140       | 0.237    | 0.385          | 0.520    |

| Table | A-2 | (cont | 'd.) |
|-------|-----|-------|------|
|-------|-----|-------|------|

|           | WHITE WOMEN |          | NONWHITE WOMEN |          |
|-----------|-------------|----------|----------------|----------|
|           | UNION       | NONUNION | UNION          | NONUNION |
| MINING    | 0.0         | 0.001    | 0.0            | 0.002    |
| DURMFG    | 0.247       | 0.096    | 0.118          | 0.045    |
| CONST     | 0.0         | 0.015    | 0.0            | 0.002    |
| TRANS     | 0.013       | 0.010    | 0.006          | 0.007    |
| COMM      | 0.127       | 0.009    | 0.031          | 0.005    |
| OTRPUBUT  | 0.007       | 0.004    | 0.0            | .004     |
| RETAIL    | 0.113       | 0.205    | 0.112          | 0.134    |
| WHOLESAL  | 0.013       | 0.022    | 0.019          | 0.009    |
| FININRE   | 0.007       | 0.125    | 0.019          | 0.066    |
| RBPAP     | 0.047       | 0.104    | 0.099          | 0.227    |
| HEPSERV   | 0.173       | 0.289    | 0.422          | 0.341    |
| YRSOLF    | 2.628       | 2.703    | 0.665          | 0.734    |
| YREDTLFP  | 3.804       | 4.189    | 4.503          | 4.641    |
| PCTFT     | 81.286      | 79.317   | 86.407         | 79.375   |
| CHILD1    | 0.267       | 0.258    | 0.453          | 0.495    |
| SPINC     | 7,961.61    | 8,579.31 | 4,590.52       | 4,182.29 |
| NONLABINC | 1,392.47    | 1,196.93 | 931.41         | 847.50   |
| UE1       | 0.020       | 0.008    | 0.0            | 0.0      |
| UE2       | 0.108       | 0.115    | 0.0            | 0.020    |
| UE3       | 0.189       | 0.218    | 0.137          | 0.230    |
| UE4       | 0.331       | 0.393    | 0.537          | 0.539    |
| UE5       | 0.155       | 0.124    | 0.162          | 0.105    |

## Table A-3

| and Nonwhite Men Fooled |                              |  |  |
|-------------------------|------------------------------|--|--|
| ED                      | .025*<br>(.10)               |  |  |
| PREV                    | .034**<br>(.009)             |  |  |
| PREV <sup>2</sup>       | 00052*<br>(.00024)           |  |  |
| PRETEN                  | .0040<br>(.0070)             |  |  |
| OJT                     | .083**<br>(.019)             |  |  |
| POSTEN                  | .050**<br>(.015)             |  |  |
| PREV*PRET               | .000031<br>(.000710)         |  |  |
| PREV*POST               | 0037**<br>(.0009)            |  |  |
| SENINDEX                | .031*<br>(.015)              |  |  |
| ED*SEN                  | 0011<br>(.0010)              |  |  |
| PREV*SEN                | 0020*<br>(.0009)             |  |  |
| PREV <sup>2</sup> *SEN  | .00003 <b>4</b><br>(.000020) |  |  |
| PRET*SEN                | 000077<br>(.000600)          |  |  |
| OJT*SEN                 | 0040*<br>(.0019)             |  |  |

Estimated Coefficients<sup>1</sup> of SENINDEX/Training Model, and F-Statistics on Group Significance of SENINDEX-Human Capital Interactions, Union Sector White and Nonwhite Men Pooled
| POST*SEN                                            | 0019<br>(.0014)                  |
|-----------------------------------------------------|----------------------------------|
| PREV*PRET*SEN                                       | .0000031<br>(.000060)            |
| PREV*POST*SEN                                       | .00019*<br>(.00008)              |
| RACE                                                | 068**<br>(.022)                  |
| Constant                                            | 5.34                             |
| Adjusted<br>R <sup>2</sup>                          | . 423                            |
| N                                                   | 673.                             |
| Regression df                                       | 47.                              |
| Controls: FT, SMSA, REG<br>INDUSTRY, and            | ION, LABOR SUPPLY,<br>OCCUPATION |
| **significant at .01 lev<br>*significant at .05 lev | rel<br>rel                       |
| <sup>1</sup> estimated standard erro                | ors in parentheses               |

Table A-3 (cont'd.)

# F-statistics on Group Significance of SENINDEX-Human Capital Interactions, Union Men Pooled

| ALL HUMAN CAPITAL | 1.98* |
|-------------------|-------|
| ALL TEN           | 2.24* |
| ALL PREV          | 2.31  |
| PREV-TEN          | 2.71  |
|                   |       |

\*significant at .05 level

Estimated Regression Coefficients<sup>1</sup> of "Pure" Experience Model for Men, With Time Out of Labor Force Controls, by Race and Union Status

|                            | WHIT                           | CE MEN                   | N                            | NONWHITE MEN                 |  |  |
|----------------------------|--------------------------------|--------------------------|------------------------------|------------------------------|--|--|
|                            | UNION                          | NONUNI                   | ION UNIO                     | N NONUNION                   |  |  |
| ED                         | .016*;<br>(.006)               | * .041**<br>(.006)       | • .021;<br>(.007             | ** .017**<br>) (.006)        |  |  |
| PREV                       | .010*<br>(.005)                | .013*1<br>(.005)         | .017<br>(.007                | * .017**<br>) (.004)         |  |  |
| PREV <sup>2</sup>          | 0001<br>(.0001                 | 00015<br>) (.00014       | 5000<br>1) (.000             | 32 .00040**<br>19) (.00010)  |  |  |
| TEN                        | .031*;<br>(.005)               | * .039**<br>(.007)       | • .026 <sup>•</sup><br>(.008 | ** .023**<br>) (.008)        |  |  |
| TEN <sup>2</sup>           | 00065<br>(.0001                | 5**00065<br>) (.00020    | 5**000<br>D) (.000           | 43 0.00069**<br>26) (.00028) |  |  |
| PREV*TEN                   | 0005<br>(.0002                 | 1*00074<br>) (.00029     | 1**000<br>9) (.000           | 91*00066**<br>39) (.00027)   |  |  |
| Constant                   | 5.57                           | 4.68                     | 5.46                         | 5.51                         |  |  |
| Adjusted<br>R <sup>2</sup> | .372                           | . 460                    | .299                         | .394                         |  |  |
| N                          | 454.                           | 553.                     | 294.                         | 405.                         |  |  |
| Regression<br>df           | 31.                            | 31.                      | 31.                          | 31.                          |  |  |
| Controls:                  | FT, SMSA, RECOCCUPATION,       | GION, TIME<br>and INDUST | OUT OF LAB<br>RY             | OR FORCE,                    |  |  |
| **significa<br>*significa  | ant at .01 le<br>ant at .05 le | vel<br>vel               |                              |                              |  |  |
| <sup>1</sup> estimated     | standard err                   | ors in pare              | entheses                     |                              |  |  |

Estimated Regression Coefficients<sup>1</sup> of "Pure" Experience Model for Women, With Time Out of Labor Force Controls, by Race and Union Status

|                            | WHITE                              | WOMEN                    | NONWHITE WOMEN     |                     |  |
|----------------------------|------------------------------------|--------------------------|--------------------|---------------------|--|
|                            | UNION                              | NONUNION                 | UNION              | NONUNION            |  |
| ED                         | .0084<br>(.0154)                   | .035**<br>(.007)         | .030*<br>(.013)    | .023**<br>(.006)    |  |
| PREV                       | .011<br>(.012)                     | .011**<br>(.004)         | 0091<br>(.0104)    | .013**<br>(.004)    |  |
| PREV <sup>2</sup>          | 00018<br>(.00037)                  | 00019<br>(.00013)        | .00051<br>(.00034) | 00034**<br>(.00013) |  |
| TEN                        | .032**<br>(.012)                   | .035**<br>(.006)         | .044**<br>(.014)   | .026**<br>(.006)    |  |
| TEN <sup>2</sup>           | 0005<br>(.0003)                    | 00084<br>(.00024)        | 0013**<br>(.0006)  | 00064**<br>(.00023) |  |
| PREV*TEN                   | 0015*<br>(.0007)                   | 00065*<br>(.00029)       | 00078<br>(.00060)  | 00088**<br>(.00029) |  |
| Constant                   | 5.33                               | 4.97                     | 5.06               | 5.07                |  |
| Adjusted<br>R <sup>2</sup> | .246                               | .387                     | .231               | . 458               |  |
| N                          | 140.                               | 723.                     | 143.               | 499.                |  |
| Regression<br>df           | 28.                                | 31.                      | 27.                | 30.                 |  |
| Controls:                  | FT, SMSA, REGI<br>OCCUPATION and   | ON, TIME OUT<br>INDUSTRY | OF LABOR F         | FORCE,              |  |
| **significa<br>*significa  | ant at .01 leve<br>ant at .05 leve | 1<br>1                   |                    |                     |  |
| <sup>1</sup> estimated     | standard error                     | s in parenth             | leses              |                     |  |

### F-Statistics Testing Average Union/Nonunion Differences, and the Effect of Seniority Provisions on Returns to Human Capital, With Time Out of Labor Force Controls, by Race and Sex, Experience Models

#### AVERAGE UNION EFFECTS

|                                           | WHITE<br>MEN         | NONWHITE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|-------------------------------------------|----------------------|-----------------|----------------|-------------------|
| All Human                                 |                      |                 |                |                   |
| Capital                                   | 2.45*                | 1.14            | 0.96           | 1.38              |
| All TEN                                   | 2.84*                | 2.18            | 0.72           | 0.58              |
| All PREV                                  | 0.20                 | 0.24            | 0.89           | 2.12              |
|                                           | SENINI               | EX EFFECTS      |                |                   |
| All Human                                 |                      |                 |                |                   |
| Capital                                   | 0.99                 | 2.29*           | 1.99           | 0.47              |
| All TEN                                   | 0.53                 | 2.38            | 2.56           | 0.38              |
| All PREV                                  | 1.91                 | 4.10**          | 0.22           | 0.56              |
| **significant at .(<br>*significant at .( | 01 level<br>05 level |                 |                |                   |

| Т | ab | 1 | е | A- | 8 |
|---|----|---|---|----|---|
|---|----|---|---|----|---|

t-Statistics for Pairwise Comparison of Union and Nonunion Coefficients, With Time Out of Labor Force Controls by Race and Sex, "Pure" Experience Model

|                     | WHITE<br>MEN                   | NONWH I TE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|---------------------|--------------------------------|-------------------|----------------|-------------------|
| ED                  | -2.95**                        | 0.43              | -1.55          | 0.49              |
| PREV                | -0.42                          | -0.06             | -0.05          | -1.81*            |
| PREV <sup>2</sup>   | 0.29                           | 0.37              | 0.02           | 2.33*             |
| TEN                 | -0.93                          | 0.26              | -0.22          | 1.18              |
| TEN <sup>2</sup>    | -0.02                          | 0.68              | 0.88           | -1.03             |
| **signif<br>*signif | ficant at .01<br>ficant at .05 | level<br>level    |                |                   |

# Estimated Regression Coefficients<sup>1</sup> of "Pure" Training Model for Men, With Time Out of Labor Force Controls, by Race and Union Status

|                             | WHIT                           | E MEN                       | NONWE                   | NONWHITE MEN        |  |  |
|-----------------------------|--------------------------------|-----------------------------|-------------------------|---------------------|--|--|
|                             | UNION                          | NONUNION                    | UNION                   | NONUNION            |  |  |
| ED                          | .012*<br>(.006)                | .038**<br>(.007)            | .018**<br>(.007)        | .015**<br>(.006)    |  |  |
| PREV                        | .0083<br>(.0047)               | .011*<br>(.005)             | .016*<br>(.007)         | .019**<br>(.005)    |  |  |
| PREV <sup>2</sup>           | 000071<br>(.000120             | 00013<br>)) (.00014)        | 00027<br>(.00019)       | 00055**<br>(.00014) |  |  |
| PRETEN                      | .0035<br>(.0022)               | .018**<br>(.004)            | .011*<br>(.005)         | 0017<br>(.0051)     |  |  |
| ojt                         | .040**<br>(.008)               | .059**<br>(.010)            | .065**<br>(.017)        | .043**<br>(.016)    |  |  |
| Posten                      | .031**<br>(.006)               | .0062<br>(.0088)            | .022 <b>*</b><br>(.009) | .014<br>(.008)      |  |  |
| PREV*PRET                   | .000022<br>(.000230            | 200068<br>0) (.00038)       | 00068<br>(.00053)       | 00051<br>(.00044)   |  |  |
| PREV*POST                   | 0015**<br>(.0004)              | 00029<br>(.00056)           | 0014*<br>(.0007)        | 00030<br>(.00054)   |  |  |
| Constant                    | 5.59                           | 4.78                        | 5.47                    | 5.53                |  |  |
| Adjusted<br>R <sup>2</sup>  | .44                            | . 48                        | .33                     | .39                 |  |  |
| N                           | 448.                           | 544.                        | 285.                    | 393.                |  |  |
| Regression<br>df            | 33.                            | 33.                         | 33.                     | 32.                 |  |  |
| Controls: F                 | F, SMSA, TIMP<br>CCUPATION, an | E OUT OF LAB<br>nd INDUSTRY | OR FORCE,               |                     |  |  |
| **significan<br>*significan | t at .01 leve<br>t at .05 leve | el<br>el                    |                         |                     |  |  |
| <sup>1</sup> estimated s    | tandard erroi                  | rs in parent                | heses                   |                     |  |  |

# Estimated Regression Coefficients<sup>1</sup> of "Pure" Training Model for Women, With Time Out of Labor Force Controls, by Race and Union Status

|                            | WHITE                        | WOMEN                         | NONWHITE WOMEN             |                      |  |
|----------------------------|------------------------------|-------------------------------|----------------------------|----------------------|--|
|                            |                              | NONUNION                      | UNION                      | NONUNION             |  |
| ED                         | .017<br>(.015)               | .037**<br>(.007)              | .028*<br>(.013)            | .023**<br>(.006)     |  |
| PREV                       | .0073<br>(.0116)             | .010*<br>(.004)               | 010<br>(.010)              | .012**<br>(.004)     |  |
| PREV <sup>2</sup>          | 00073<br>(.00039)            | 00022<br>(.00013)             | .000 <b>44</b><br>(.00035) | 00037**<br>(.00013)  |  |
| PRETEN                     | .016**<br>(.005)             | .019**<br>(.004)              | .0089<br>(.0129)           | .022**<br>(.005)     |  |
| OJT                        | .037<br>(.050)               | .102**<br>(.016)              | .00027<br>(.04030)         | .096**<br>(.028)     |  |
| POSTEN                     | 0063<br>(.0126)              | .011<br>(.006)                | .021<br>(.014)             | 0039<br>(.0066)      |  |
| PREV*PRET                  | 0024**<br>(.0008)            | 0012**<br>(.0005)             | 00074<br>(.00096)          | 0019**<br>(.0004)    |  |
| PREV*POST                  | .0027<br>(.0013)             | 000051<br>(.000530)           | 00015<br>(.00107)          | .000025<br>(.000049) |  |
| Constant                   | 5.38                         | 4.97                          | 5.10                       | 5.14                 |  |
| Adjusted<br>R <sup>2</sup> | .29                          | . 40                          | .19                        | . 47                 |  |
| N                          | 140.                         | 709.                          | 141.                       | 484.                 |  |
| Regression<br>df           | 30.                          | 33.                           | 29.                        | 32.                  |  |
| Controls:                  | FT, SMSA, I<br>OCCUPATION    | REGION, TIME<br>, and INDUSTI | OUT OF LABOI               | R FORCE,             |  |
| **significa<br>*significa  | ant at .01 i<br>ant at .05 i | level                         |                            |                      |  |
| <sup>1</sup> estimated     | standard e                   | rrors in pare                 | entheses                   |                      |  |

F-Statistics Testing Average Union/Nonunion Differences and the Effect of Seniority Provisions on Returns to Human Capital, by Race and Sex, Training Model, With Time Out of Labor Force Controls

|                          | WHITE<br>MEN | NONWHITE<br>MEN | WHITE<br>WOMEN | NONWHITE<br>WOMEN |
|--------------------------|--------------|-----------------|----------------|-------------------|
|                          | AVERAGE U    | NION EFFECT:    | 5              |                   |
| All Human<br>Capital     | 3.93**       | 1.59            | 1.80           | 2.13*             |
| All TEN                  | 4.46**       | 2.26*           | 2.17           | 2.20              |
| All PREV                 | 1.31         | 1.18            | 1.85           | 1.52              |
|                          | SENIND       | EX EFFECTS      |                |                   |
| All Human<br>Capital     | 1.28         | 2.28*           | 1.34           | 0.64              |
| All TEN                  | 1.64         | 1.86            | 1.05           | 0.89              |
| All PREV                 | 1.27         | 3.06*           | 1.45           | 0.80              |
| PREV-TEN<br>Interactions | 1.31         | 2.88*           | 1.71           | 1.22              |
| ++                       | 01 10001     |                 |                |                   |

\*\*significant at .01 level
\*significant at .05 level

t-Statistics for Pairwise Comparison of Union and Nonunion Coefficients, by Race and Sex, Training Model, With Time Out of Labor Force Controls

|                   | WHITE<br>MEN | NONWH I TE<br>MEN | WHITE<br>WOMEN | NONWH I TE<br>WOMEN |
|-------------------|--------------|-------------------|----------------|---------------------|
| ED                | -2.97**      | 0.42              | -1.25          | 0.34                |
| PREV              | -0.34        | -0.38             | -0.24          | -1.93*              |
| PREV <sup>2</sup> | 0.36         | 1.20              | -1.22          | 2.16*               |
| PRETEN            | -3.53*       | 1.72*             | -0.39          | -0.93               |
| OJT               | -1.54        | 0.93              | -1.22          | -1.94**             |
| POSTEN            | 2.37*        | 0.63              | -1.22          | 1.55                |
| **signif:         | icant at .01 | level             |                |                     |

\*significant at .05 level

# Estimated Regression Coefficients of SENINDEX/Experience Model, With Time Out of Labor Force Controls, by Race and Sex, Union Sector

|                         | WHITE    | NONWH I TE     | WHITE    | NONWHITE |
|-------------------------|----------|----------------|----------|----------|
|                         | Men      | MEN            | WOMEN    | WOMEN    |
| ED                      | .027     | .039*          | .033     | .019     |
|                         | (.016)   | (.015)         | (.029)   | (.026)   |
| PREV                    | .014     | .071**         | 0036     | 014      |
|                         | (.013)   | (.017)         | (.0286)  | (.022)   |
| PREV <sup>2</sup>       | 000020   | 0015**         | .00016   | .0010    |
|                         | (.00032) | (.0005)        | (.00097) | (.0007)  |
| TEN                     | .037*    | .074**         | .078*    | .035     |
|                         | (.015)   | (.023)         | (.030)   | (.032)   |
| TEN <sup>2</sup>        | 00066    | 0013*          | 0034**   | 0011     |
|                         | (.00044) | (.0006)        | (.0012)  | (.0017)  |
| PREV*TEN                | 0010     | 003 <b>4**</b> | 0011     | 0013     |
|                         | (.0006)  | (.0010)        | (.0018)  | (.0014)  |
| SENINDEX                | .015     | .070**         | .039     | 011      |
|                         | (.022)   | (.024)         | (.034)   | (.025)   |
| ED*SEN                  | 0012     | 0025           | 0024     | .0011    |
|                         | (.0015)  | (.0015)        | (.0026)  | (.0018)  |
| PREV*SEN                | 00018    | 0054**         | .0021    | .00032   |
|                         | (.00124) | (.0016)        | (.0031)  | (.00195) |
| PREV <sup>2</sup> * SEN | 000024   | .00012**       | 00005    | 000047   |
|                         | (.00003) | (.00004)       | (.00012) | (.00006) |

|                                                                  | WHITE<br>MEN        | NONWHITE<br>MEN      | WHITE<br>WOMEN      | NONWHITE<br>WOMEN  |  |
|------------------------------------------------------------------|---------------------|----------------------|---------------------|--------------------|--|
| TEN*SEN                                                          | 00098<br>(.00141)   | 0044*<br>(.0021)     | 0048<br>(.0029)     | .00044<br>(.00282) |  |
| TEN <sup>2</sup> SEN                                             | .000010<br>(.00004) | .000072<br>(.000060) | .00028*<br>(.00012) | 000024<br>(.00014) |  |
| PR*TEN*SEN                                                       | .000057<br>(.00006) | .00023*<br>(.00009)  | 000078<br>(.00017)  | .00078<br>(.00012) |  |
| Constant                                                         | 5.46                | 4.79                 | 4.95                | 5.20               |  |
| N                                                                | 405.                | 272.                 | 129.                | 135.               |  |
| Adjusted<br>R <sup>2</sup>                                       | . 372               | . 322                | .312                | . 193              |  |
| Regression<br>df                                                 | 37.                 | 37.                  | 34.                 | 33.                |  |
| <pre>**significant at .01 level  *significant at .05 level</pre> |                     |                      |                     |                    |  |

# Table A-13 (cont'd.)

| Tab | le | A- | ·14 |
|-----|----|----|-----|
|-----|----|----|-----|

Estimated Regression Coefficients<sup>1</sup> of SENINDEX/Training Model, With Time Out of Labor Force Controls, by Race and Sex, Union Sector

|                        | WHITE           | NONWH I TE    | WHITE     | NONWHITE  |
|------------------------|-----------------|---------------|-----------|-----------|
|                        | MEN             | MEN           | WOMEN     | WOMEN     |
| ED                     | .024            | .037**        | .039      | .029      |
|                        | (.016)          | (.015)        | (.031)    | (.027)    |
| PREV                   | .012            | .066**        | .012      | 014       |
|                        | (.012)          | (.017)        | (.028)    | (.022)    |
| PREV <sup>2</sup>      | .0000 <b>44</b> | 0013**        | 0010      | .0011     |
|                        | (.000320)       | (.0004)       | (.0012)   | (.0007)   |
| PRETEN                 | .0085           | .008 <b>4</b> | .033      | .0028     |
|                        | (.0080)         | (.0172)       | (.027)    | (.0375)   |
| OJT                    | .075**          | .152**        | .12       | 083       |
|                        | (.021)          | (.052)        | (.13)     | (.087)    |
| Posten                 | .032            | .065*         | 012       | .026      |
|                        | (.020)          | (.027)        | (.036)    | (.030)    |
| PRV*PRET               | 00027           | 00028         | 0075**    | 00012     |
|                        | (.00087)        | (.00177)      | (.0026)   | (.00267)  |
| PRV*POST               | 0036*           | 0051**        | .0023     | 0028      |
|                        | (.0016)         | (.0016)       | (.0033)   | (.0021)   |
| SENINDEX               | .013            | .069**        | .033      | 0029      |
|                        | (.022)          | (.024)        | (.037)    | (.0276)   |
| ED*SEN                 | 0013            | 0026          | 0018      | .00027    |
|                        | (.0015)         | (.0016)       | (.0031)   | (.00203)  |
| PREV*SEN               | 0000094         | 0051**        | 00099     | .000011   |
|                        | (.00120)        | (.0016)       | (.00334)  | (.001950) |
| PREV <sup>2</sup> *SEN | 000024          | .00010**      | .000040   | 000052    |
|                        | (.00003)        | (.00004)      | (.000140) | (.000060) |

|                                       | WHITE                    | NONWHITE   | WHITE           | NONWHITE  |
|---------------------------------------|--------------------------|------------|-----------------|-----------|
|                                       | MEN                      | MEN        | WOMEN           | WOMEN     |
| PRET*SEN                              | 00053                    | 00034      | 0015            | .00024    |
|                                       | (.00069)                 | (.00147)   | (.0020)         | (.00289)  |
| OJT*SEN                               | 0035                     | 0093       | 0068            | .012      |
|                                       | (.0020)                  | (.0052)    | (.0107)         | (.011)    |
| POST*SEN                              | 000041                   | 0038       | 00035           | 0012      |
|                                       | (.001860)                | (.0025)    | (.00391)        | (.0025)   |
| PREV*PRET*SEN                         | .000039                  | 0000043    | .000 <b>4</b> 2 | 000025    |
|                                       | (.000070)                | (.000140)  | (.00023)        | (.000210) |
| PREV*POST*SEN                         | .00016                   | .00035*    | .000091         | .00028    |
|                                       | (.00013)                 | (.00015)   | (.000360)       | (.00018)  |
| Constant                              | 5.48                     | 4.80       | 4.99            | 5.12      |
| Adjusted<br>R <sup>2</sup>            | .40                      | .36        | .33             | .15       |
| N 4                                   | 00.                      | 263.       | 129.            | 133.      |
| Regression<br>df                      | 31.                      | 31.        | 28.             | 27.       |
| <b>F-statistic</b>                    | 7.51**                   | 4.58**     | 2.69**          | 1.61*     |
| <pre>**significant *significant</pre> | at .01 lev<br>at .05 lev | vel<br>vel |                 |           |

Table A-14 (cont'd.)

<sup>1</sup>estimated standard error in parenthesis.

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