The personal earnings distribution: Individual and institutional determinants

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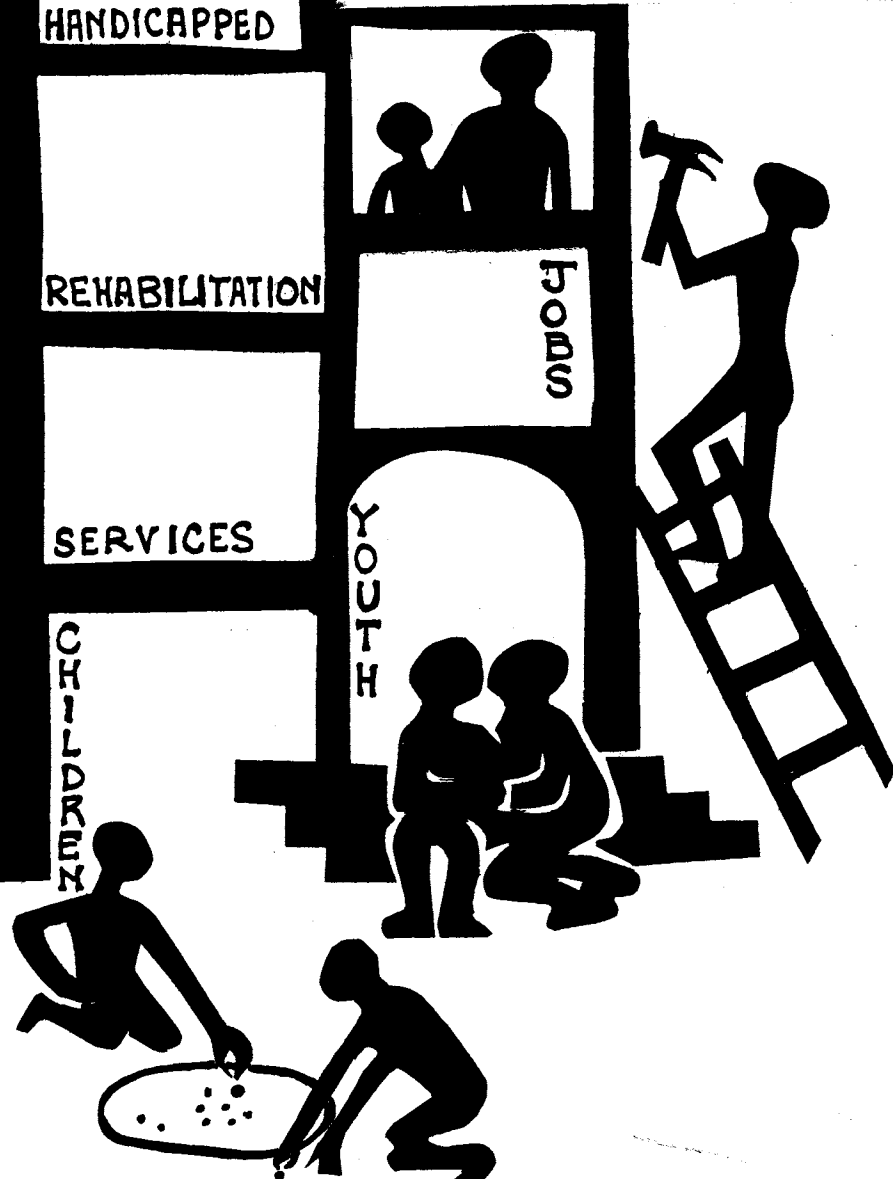
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THE PERSONAL EARNINGS DISTRIBUTION:
INDIVIDUAL AND INSTITUTIONAL DETERMINANTS

by Barry Alan Bluestone

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ABSTRACT

THE PERSONAL EARNINGS DISTRIBUTION: INDIVIDUAL

AND INSTITUTIONAL DETERMINANTS

by

Barry Alan Bluestone

This study investigates the determinants of the earnings distribu-
tion in the United States paying particular attention to the less-skilled
segment of the workforce.

A general earnings theory is proposed which has elements of human
capital theory, institutional hypotheses, and radical stratification
analysis. Much attention is paid to testing the "crowding" hypothesis
that workers restricted to employment in a limited number of industries
or occupations will be paid substantially less than workers who are not
so restricted. It was hypothesized that after controlling for differences
in human capital, large wage differentials would continue to exist for
similarly qualified workers. These differences could be attributed to
the stratification of the labor force, particularly by race and sex. Once
stratified, differences in industry characteristics would have an effect
on the personal earnings distribution as well. Those workers who gain
employment in the more concentrated, profitable, and unionized industries
will earn more than others who have similar work characterics.

The regression results, based on a large integrated micro-macro data set, yield extensive evidence of stratification and industry variables affecting earnings after controlling for differences in human capital. This is especially true among the least skilled workers in the labor force although there is a substantial earnings effect throughout most of the occupational hierarchy. While it was impossible to obtain incontrovertible evidence that "crowding" was the culprit in producing "human capital constant" wage differentials, the evidence seems to point overwhelmingly in this direction. Concentration and unionization also have a significant impact on wages as well as a number of other industry factors.

The overriding policy implication following from this analysis is that large scale government intervention is required in order to correct the apparently massive "inefficiencies" that currently exist in American labor markets. Intervention is required to equalize human capital investment opportunities but equally important to break down the barriers to inter-occupational and inter-industry mobility that apparently still exist.

PREFACE

The present study began a number of years ago, when in the
course of poverty research, the common stereotype of the poor was
shattered by the revelation that the majority of the poor work
and in nearly a third of all poor households the head works full-time
all year round.[1,2] The AFDC mother, the aged, the infirm, the
industrially "undisciplined," in short those out of the labor force
or unemployed were found to be only a portion of the poor. For many
others poverty was discovered to be the result of low-wage employment
rather than no employment at all.

Many of the particular causes which explain the poverty of the
nonworking poor--sickness, old age, illiteracy, and "bad luck"--fail
to adequately explain the poverty incomes of those who work. For
them poverty is a much more complex phenomenon going beyond individual

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[1]Some of the earliest research on the working poor include:
George Delehanty and Robert Evans, Jr., "Low-Wage Employment: An
Inventory and an Assessment" (Northwestern University, n.d.)
unpublished manuscript; Laurie D. Cummings, "The Employed Poor:
Their Characteristics and Occupations," Monthly Labor Review, July
1965; Dawn Wachtel, The Working Poor (Ann Arbor: Institute of Labor
and Industrial Relations, University of Michigan-Wayne State
University, 1967) mimeo; Barry Bluestone, "Low-Wage Industries
and the Working Poor," Poverty and Human Resources Abstracts, March
1968.

[2]Computed from "Work Experience of Family Heads, by Poverty
Status of Family, 1968," U.S. Department of Labor, Manpower Report
of the President (Washington: U.S. Government Printing Office),
March 1970, Table 1, p. 121.

inadequacies. The confluence of market forces and personal attributes forms a complex web from which the individual factors contributing to low earnings are difficult to unravel. Wage theory should help us understand the problem, but so far it has generally failed.

The reason for this is that the simplifying assumptions in traditional wage theory tend to confuse the issue. The assumption of a homogeneous labor force, found in the institutionalist framework, tends to obscure the earnings effect of differences in skills and competencies among workers. Alternatively assuming perfect competition and labor mobility as in the pure human capital theory obscures many other factors which impose their own order on the distribution of income and earnings. An understanding of the working poor requires a general wage theory that focuses on both the characteristics of workers themselves, and on the labor markets in which they work, while dropping the restrictive assumptions normally found in traditional wage theory. To understand the determinants of low wages requires an understanding of the whole distribution of earnings. What began as a narrow study of poverty employment thus blossomed into a more general investigation of the determinants of personal earnings in the United States.

My original interest in the problem was spurred by Louis Ferman, Director of the Research Division of the Institute of Labor and Industrial Relations, University of Michigan-Wayne State University. My colleagues Mary Stevenson and Charles Betsey helped prepare the

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CHAPTER I

INTRODUCTION

What factors determine an individual's wage? How are earnings
related to "skills" and to "productivity." To what extent does the
distribution of personal earnings reflect the distribution of skills
and to what extent institutional factors? These are the fundamental
questions which are the concern of this dissertation.

There exists today no generally agreed upon wage theory.
Rather there exists a set of hypotheses, each constrained by its own
set of assumptions, each with its own distinct set of "exogeneous
variables," and each in competition with the other. Consequently,
there is general confusion over the relationship between "wage,"
"skill," and "productivity." Adam Smith's theory of "compensatory"
wage differentials, J.B. Clark's marginal productivity theory, and
the investment theory of earnings stemming from the work of Denison,
Schultz, and Becker all posit a tight relationship between an
individual's own skills, productivity, and earnings. In opposition,
institutionalist wage theory discards the neoclassical assumptions
of perfect product and labor markets thereby disrupting a more
perfect mapping of human capital into the distribution of earnings.
Industrial characteristics replace human capital attributes as the
primary variables in institutional wage theory. "Radical" wage

theory, based on social stratification analysis, goes beyond the institutionalist critique, severing any link between personal human capital investment decisions and individual earnings. An individual's stock of human capital, according to radical theory, is a function of class, race, and sex. Relative earnings are determined by social status rather than individual choice in the acquisition of human capital.

The competition between neoclassical, institutionalist, and radical theories remains largely unresolved.[1] Each theory has a distinct wage generating function which explains only a portion of the existing variance in earnings. Generally the theories have not been tested against each other. Consequently, a wage theory synthesis has not evolved, much less a new scientific "paradigm," to use the terminology of Thomas Kuhn.[2]

Yet the framework for a synthesis can be constructed. By substituting the assumptions of institutionalist and radical theory into the overly restrictive model of the neoclassical paradigm, a "flexible" general wage theory can be developed. Specifically accounting for imperfect product and labor markets produces a wage theory capable of defining the complex links between human capital, industry and occupational attachment, and the distribution of earnings.

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[1]For the best discussion of the competition, see David M. Gordon, Theories of Poverty and Underemployment (Lexington: D.C. Heath, 1972).

[2]Thomas Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1962).

In the general theory developed here a human capital earnings
function is modified to allow for institutional barriers to
industrial and occupational access along racial and sexual lines.
The independent effects of industry characteristics such as unioni-
zation, concentration, profits, and capital-intensity also enter into
the wage model.

Wage Theory and the Study of Poverty

A correct specification of the wage determination process is of
more than academic interest. A good part of the government's
antipoverty strategy of the 1960s was based on labor market studies.
Translated into public policy, human capital research contributed to
the emphasis on manpower and human resource development programs.
Along this line, the so-called war on poverty was designed to "find
new means for offering disadvantaged groups in urban and rural
America a chance to develop their own capacities and become productive
members of our society."[3] Federal outlays for all manpower
activities rose steadily during the latter part of the decade in
response to the presumption "that education and training are
especially effective ways to bring people out of poverty."[4] Programs
totalling only $184 million dollars in 1964 grew to nearly $2.4 billion

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[3]"The Budget Message of the President," The Budget of the United
States Government, Fiscal Year 1970 (Washington, D.C.: U.S. Government
Printing Office, 1969), p. 47.

[4]Thomas I. Ribich, Education and Poverty (Washington: Brookings
Institution, 1968), p. 1.

by 1970.[5]

The results of this effort were mixed. The government's attempt to "upgrade," "rehabilitate," "train," "retrain," "integrate," "reintegrate," and "prepare" the poor for the job market was often in vain. The payoff in terms of employment gains and increasing earnings frequently failed to live up to expectations. No matter how measured, the cost of a particular program often exceeded the benefits. Many programs had low job retention rates and often entrants did not complete their training cycle. In other cases trainees completed a manpower program only to find it impossible to gain adequate employment.[6]

Particular manpower programs failed because of insufficient funding, lack of coordination, inadequate training, and poor forecasting of job opportunities. But even the successes brought little reason for enthusiasm. For those who completed MDTA training in the middle of the 1960s, only three out of five advanced in pay, and the increased earnings were quite small. According to the largest study of MDTA, involving over 100,000 institutional training graduates,

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[5]Sar A. Levitan, "Manpower Programs Under Republican Management," Poverty and Human Resources, March-April, 1970, p. 12.

[6]In a comprehensive analysis of the institutional portion of the MDTA program it was found that over 30 percent of the trainees dropped out before completing vocational training and only 58 percent found jobs related to their training curriculum. For a comprehensive overview of the manpower programs in the 1960s, see Sar A. Levitan and Garth L. Mangum, Federal Training and Work Programs in the Sixties (Ann Arbor: Institute of Labor and Industrial Relations, 1969).

the average wage for males <u>after</u> training was $2.06 an hour,

27 percent higher than the average pretraining wage. For females,

the post-training wage was raised to $1.53, less than 20 percent

above pretraining levels and below the then prevailing federal minimum

wage.[7] What is worse, these statistics apply only to those who

actually completed a manpower program <u>and</u> found jobs. Thousands of

other failed to complete programs and others finished and could find

no suitable employment.[8]

What explains the apparently low returns on investment in

manpower programs? One explanation, of course, is that existing

programs actually add little to the "human capital" of the disadvantaged.

Much more extensive human resource programs are necessary before

satisfactory returns can be anticipated. The other explanation rests

on the hypothesis that a lack of human capital is not the major barrier

to economic success for the poor. Augmenting an individual's stock

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[7]U.S. Department of Labor, Manpower Administration, "The
Influence of MDTA on Earnings," <u>Manpower Evaluation Report</u>, No. 8
(Washington: U.S. Government Printing Office, December 1968), p. 18.

[8]In place of institutional manpower programs, on-the-job training
funded by the federal government has provided more people directly
with jobs. But according to a GAO report, the federally-funded on-the-
job training program is no more than a transfer system whereby the
government pays for specific job training which would normally be pro-
vided by the cooperating firm in spite of the program. The General
Accounting Office uncovered the fact that: "OJT contracts had served
primarily to reimburse employers for OJT which they would have con-
ducted even without the government's financial assistance. These
contracts were awarded even though the intent of the program was to
induce new or additional training efforts beyond those usually carried
out." See U.S. General Accounting Office, "Improvements Needed in
Contracted for On-the-Job Training under the Manpower Development and
Training Act" (Washington: U.S. Government Printing Office, 1968).

of human capital, it may be argued, yields an insignificant marginal

return because employment opportunities are nonexistent or highly

restricted. The "low-wage" workforce may possess the human capital

characteristics of higher paid members of the labor force, but fail

to earn larger incomes because of geographical immobility, the high

cost of job information, or racial and sexual discrimination. Low

relative earnings can result from the "crowding" of a subset of the

workforce into a limited number of industries and occupations.[9]

Denied access to other economic sectors for which they are qualified

on the basis of human capital, members of the "low-wage" workforce may

be competing with each other for the limited supply of jobs in the

sectors open to them. In this case, the maintenance of an "oversupply"

of workers in the "low-wage" sector may be the primary reason for low

wages, not a lack of human capital. In addition, the industries to

which economic minorities are restricted may consist of marginal firms

operating within an economic environment characterized by low capital-

labor ratios, strong product market competition, and weak unions.

For any given degree of "crowding," firms in less "permissive"

economic environments may offer lower wages. Poverty earnings will

then be a function of social "underemployment" rather than personal

"underinvestment."

"Relative Underemployment" can be said to exist when an individual

qualifies for higher wage employment on the basis of human capital but

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[9]The "crowding" hypothesis can be traced to F.Y. Edgeworth,
"Equal Pay to Men and Women," Economic Journal, December 1922.

is denied access to it on other grounds. If underemployment is

widespread among low-wage workers, the problem of low-wage employment

is then only partly the effect of inadequate human capital. In this

case manpower programs will have a limited ability to make improvements

in the earnings of the low-paid.

To what extent low wages reflect inadequate amounts of human

capital versus restricted access to employment opportunity can only

be ascertained through an empirical investigation which permits both

factors to simultaneously enter the analysis. This is the reason

for developing a testable "general" wage theory. Measuring the effect

of human capital on the wage rate _relative_ to the effects of industry

variables and restricted employment opportunity is the necessary

prerequisite for understanding both the promise and the limitations

of manpower policy. Beyond this, the testing of a general wage theory

focuses attention on the factors which are most important in the wage

determination process for all members of the workforce. Such research

can empirically account for the major variables Thurow had in mind

when he concluded that "the distribution of human capital is an

important ingredient in the distribution of income, but it is not the

sole ingredient. The actual dispersion of income is much greater than

would be predicted by the distribution of human capital."[10]

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[10]Lester C. Thurow, _Poverty and Discrimination_ (Washington:
The Brookings Institution, 1969), p. 109.

The Design of the Study

The study proceeds in the following way to construct and test a
general model of wage determination. The major strands of a general
wage theory are discussed in Chapter II. Marginal productivity
theory,the institutional analysis, human capital theory, and social
stratification hypotheses are initially discussed. Each theory is
carefully weighed in order to glean material useful for developing a
testable wage determination model.

The general model is developed in Chapter III. A complete
theory of wage determination is first constructed which takes as
its premise a "deterministic" view of social relations. The distribu-
tion of earnings is made a function of four exogenous variables: race,
sex, social class, and innate ability. Following this a specific
testable model is derived based on human capital, institutional, and
stratification hypotheses. The specific model is constructed so as
to hold human capital constant allowing the earning effect of industry
and occupation "crowding" to be measured. From this a reduced form
earnings generating function is developed. Chapter IV discusses the
econometric techniques used to measure the independent effects of
human capital and "crowding." Attention is paid to the potential
problem of multicollinearity and the statistical procedures used to
overcome them.

The statistical results follow in Chapter V. Regressions are
presented for five separate occupation groups which span the range of
all specific occupations in the United States. Individual regressions

are reported for each race-sex group as well as pooled race-sex
equations. In addition pooled regressions are presented which cover
the whole spectrum of occupations. The effect of individual human
capital, industry, stratification, and working conditions variables
is discussed.

An evaluation of the empirical results follows in Chapter VI.
Here the regressions are interpreted so as to parcel out the variance
in earnings due to human capital factors as a whole viz-a-viz labor
force stratification. Wage "ranges" are established for each
occupation group and each race-sex group based on a technique which
allows the human capital variables to be held constant while the
industry and stratification variables are permitted to vary together
according to empirically derived coefficients.

The final chapter is devoted to general conclusions and policy
implications. Emphasis is placed on the role of manpower policy in
the general antipoverty strategy. Some of the implications for
training programs and income maintenance schemes are explored.
Finally, there is some speculation as to the justification for the
present distribution of earned income, given the empirical results
found in this analysis.

There are two appendices in addition to the seven chapters.
Appendix A contains a description of the integrated macro-micro data
set with a discussion of its construction. Variables used in the
regression analysis are defined and the shortcomings in each is noted.
Appendix B contains the means and standard deviations for each

regression as well as a complete set of zero-order correlation

matrices for all of the empirical results.

CHAPTER II

EXISTING THEORIES OF WAGE DETERMINATION

Individual prices reflect a near infinite set of past, present,

and even future events. Previous capital expenditures, the whole

galaxy of current prices of complementary and substitute products,

and expectations about future prices all impinge on the current

market value of each good. Consumer attitudes, changing tastes,

government subsidies, tariff policy, antitrust action and hundreds

of other factors interact to determine millions of prices.

Nevertheless, the key factors which determine the price of most final

and intermediate goods are well-known.

Yet economists have always been perplexed by one special case:

the price of labor.

> Marshall, Pigou, Taussig, and other leading theorists were
> troubled by the "peculiarities" of the labor market—the
> fact that the worker sells himself with his services, that
> his immediate financial need may place him at a disadvantage
> in negotiating with employers, that he is influenced by
> nonpecuniary motives, that he has limited knowledge of
> alternative opportunities, and that there are numerous objective
> barriers to free movement of labor.[1]

Numerous attempts have been made to fit the theory of wages

into a more general analysis of price. By assuming away a number of

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[1]Lloyd Reynolds, The Structure of Labor Markets (New York:
Harper and Brothers, 1951), p. 2.

the "peculiarities" of the labor market, economists have treated labor in the same manner as other productive inputs in the economy. "The theory of the determination of wages in a free market is simply a special case of the general theory of value," Hicks wrote. "Wages are the price of labour; and thus, in the absence of control, they are determined, like all prices, by supply and demand."[2]

The history of labor theory is rich in these abstract attempts, but poor in empirical verification. The relative impact of supply and demand forces on the wage rate remains, for the most part, a mystery. Even Hicks admitted that "a long road has to be travelled" before the concepts of wage theory "can be used in the explanation of real events."[3] Barbara Wootton has responded that, "In practice this road seems to have been not only long, but so exhausting that few travellers have attempted it."[4]

Before setting out on this difficult road, it seems good practice to review some of the theories developed in the past. Four broad strands in the development of wage theory can be discerned: (1) marginal productivity theory (2) institutional theory (3) human capital theory, and (4) social stratification analysis. Most wage theory fits into at least one of these categories.

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[2] J.R. Hicks, The Theory of Wages (London: MacMillan, 1932), p. 1.

[3] Ibid., p. 10.

[4] Barbara Wootton, The Social Foundations of Wage Policy (London: Unwin University Books, 1955), p. 12.

What we are ultimately searching for is a theory that will explain the empirically observed distribution of personal earnings. Furthermore such a theory must be capable of describing and interpreting the relationship between the personal characteristics of the individual worker and the wage he or she receives in the marketplace. Of particular concern is the relationship between the wages received and a subset of personal characteristics which we shall call the "endogenous productivity characteristics" of the individual.

By the term "endogenous productivity characteristics" we shall refer to the innate and acquired physical and mental attributes of the worker useful as inputs in the production process. This term is synonymous with the term "human capital" when defined narrowly "as an individual's productive skills, talents, and knowledge."[5] This new terminology is introduced because the term "human capital" has been broadened in some recent literature to include such factors as race, sex, and the physical attractiveness of the individual. While these factors may be important in determining the distribution of earnings, we find it useful to separate out the personal characteristics which would have no relationship to the distribution of earnings in a "blind" economy—an economy in which the productivity of an individual was not related to color, sex, or physical beauty.[6] Given

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[5]Lester C. Thurow, _Investment in Human Capital_ (Belmont: Wadsworth Publishing Co., 1970), p. 1.

[6]This, of course, should not be construed as to deny the importance of these factors in the actual distribution of earnings.

this understanding the terms "endogenous productivity characteristics" and "human capital" will be used interchangeably.

In the next section we shall introduce the term "endogenous productivity" which relates to the _potential_ output of an individual given his or her endogenous productivity characteristics. Endogenous productivity can be shown to be theoretically distinct from the more common term, marginal productivity of labor.

Marginal Productivity Theory

Much of the debate over the distribution of earnings rests on a more fundamental theoretical debate concerning the usefulness of marginal productivity theory. Consequently the theory provides a good starting point for any discussion of wage determination.

Orthodox or traditional wage theory rests on the fundamental proposition that labor is paid its marginal product. "Workers are paid according to how much they contribute to marginal increases in output. If increasing the number of employed workers by one worker would increase output by $5,000, workers should be paid $5,000."[7] If there are no additions to complementary inputs in the production process, the wage of the "marginal" worker and all intramarginal workers

Physical attractiveness, for instance, may be the most important personal attribute in some lines of work. Whether an individual receives a particular job or not may be a function of physical attractiveness and the actual market value of an individual in certain occupations is a function of such factors as well. The distinction between skill, for instance, and racial and sexual characteristics is clear enough; physical attractiveness falls into a grey area somewhere in-between.

[7]Lester Thurow, _Poverty and Discrimination_, p. 26.

will be exactly equal to the full measure of any additional output.

This result follows according to marginal productivity theory assuming no barriers to labor mobility, a homogeneous labor force, and assuming that all employment yields homogeneous nonpecuniary utility (or disutility). Where the product market is characterized by reasonable competition and labor is freely mobile between employers, the wage rate will equal the value of the marginal physical product.

$$w_i = VMP_i = (MPP_i \cdot P)$$

Where the product market is characterized by monopoly elements, the equilibrium wage will equal the marginal revenue product.

$$w_i = MRP_i = (MPP_i \cdot MR)$$

In either case an employer will not hire an additional worker if revenue generated by that individual is less than the addition to his wage bill. This assures the wage of labor will never be _above_ its marginal revenue product, at least as long as employers attempt to maximize profits. The assumption of competition among employers for labor services, on the other hand, assures the wage will not fall _below_ labor's marginal revenue product, and in the case of perfect product markets, not below VMP.

Under conditions of monopsony in the labor market, labor is paid less than its marginal revenue product.

$$w_i < MRP_i$$

Monopsonistic employers face a rising supply curve rather than an infinitely elastic supply of labor. Additional workers can only be obtained by increasing the wage. In the absence of wage "discrimination," the marginal cost of labor increases by more than the wage bill paid to the marginal worker. The employer has to pay the higher wage rate not only to the additional worker, but to all of his workforce. Under these conditions, the marginal cost of labor will lie above the wage rate, and equilibrium will therefore be reached at a point where the marginal productivity of labor exceeds the wage level.

The traditional analysis of wage determination has normally been applied at either the level of the aggregate economy or at the level of the firm; marginal productivity theory was not specifically developed to explain the personal distribution of income. At the level of economy, the supply of labor is assumed perfectly inelastic or upward sloping. In this case the theory is useful as a theory of aggregate wages. At the level of the individual firm, the supply of labor is assumed perfectly elastic (with the exception of the monopsony case) and the theory describes the level of employment in each firm.

As long as there is perfect mobility of labor and labor is homogeneous, there will exist a unique market clearing wage throughout the economy. Each worker will receive exactly the same remuneration[8]

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[8]This again assumes that all jobs have homogeneous nonpecuniary utility. Where this assumption does not hold, "compensatory" wage

and each firm will hire just enough labor at this rate so as to keep marginal revenue product (or the value of marginal product) from falling below the market wage.

Classical marginal productivity theory paid little attention to the characteristics of labor supply; labor was assumed homogeneous throughout the economy or homogeneous within major categories or broad occupations. The quality of labor was consequently accepted as given. It was assumed that workers of a given quality could move from one employer to another without interference. Relaxing the labor homogeneity assumption, but retaining the assumption of perfect mobility, yields a "modern" marginal productivity theory which is theoretically capable of describing the personal distribution of earnings among workers with different levels of human capital. As Thurow has noted, "In an economy with perfect competition and in equilibrium, the distribution of marginal products is identical with the distribution of earned income."[9] And,

> the supply and demand for labor with differing skills and knowledge would determine the marginal product of each variety of labor. Individual earnings would equal their marginal products, and the allocation of human capital would determine the distribution of earnings.[10]

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differentials develop to account for differences in the nonpecuniary advantages or disadvantages of particular jobs.

[9]Lester Thurow, _Poverty and Discrimination_, p. 29.

[10]_Ibid._, p. 96.

Given free access to the labor and product markets consistent with their human capital, workers will be distributed so as to maximize the total value of output and in turn each worker's marginal productivity and wage. If the equilibrium is disturbed in some way (by the introduction of new technology, for instance), the labor force will be reallocated so that once again the ordinal ranking of endogenous productivity characteristics is consistent with maximized output. From an efficiency standpoint, the wage structure under these conditions will be optimal. From the viewpoint of "equity," the personal distribution of earnings will be colinear with the distribution of human capital.

The colinear relationship between earnings and human capital will occur whether the product market is characterized by perfect competition or monopoly. However once monopsonistic elements are introduced into the labor market, colinearity disappears. Labor of given quality will receive less in the monopsonistic firm and the differential will persist as long as mobility to other firms is restricted. Where labor differs as to quality, the statistical colinearity between human capital and earnings depends on which group of workers is restricted to the monopsonized sector. In any case the hypothesized link between endogenous productivity characteristics and wage rates no longer holds.

The usefulness of the marginal productivity theory as a theory of the distribution of earnings rests on the assumption of perfect mobility of labor. To the extent that this assumption is violated in

the real world, the theory fails to adequately explain wage
determination. It fails for it specifies only one of the two critical
linkages between the distribution of earnings and the distribution of
human capital. The linkage between the wage rate and the marginal
revenue product of labor is well described by the theory. What is
not specified is the connection between MRP and the level of human
capital. This link relies on the nature of the labor market. It is
possible that every worker is paid his marginal revenue product at
the same time that his marginal revenue product bears no relationship
to his level of human capital. Given imperfect mobility of labor,
it is possible that:

(1) $w_i = MRP_i$

(2) $MRP_i \neq f(\text{Human Capital})$

In this case a knowledge of the distribution of human capital would
be insufficient to describe the distribution of wage income.

At this point it is helpful to introduce a new term in order to
differentiate between the _actual_ marginal revenue product of each
worker and the _hypothetical_ marginal revenue product each worker would
receive _if there were no barriers to labor mobility and the economy_
were in equilibrium. This hypothetical marginal revenue product
shall be referred to as the "endogenous revenue product." The
endogenous revenue product of individual i (ERP_i) is the marginal
revenue product individual i, possessing endogenous productivity
characteristics, C_j, would receive if he were to compete freely in the

labor market with all other workers with characteristics C_j.

To clarify the distinction assume that all labor is of homogeneous quality and there are two firms operating with identical labor demand curves. Under the condition of perfect labor mobility, all workers will earn a wage, w_i, equal to the economy-wide marginal revenue product, MRP*.[11] Now introduce an arbitrary barrier to labor mobility which results in three-fourths of the total labor force being restricted to Firm B. (See Figure 2.1)

FIRM B   FIRM A

MRP_A

MRP*

MRP_B

Employment in B E_B E* E_A E*   Employment in A
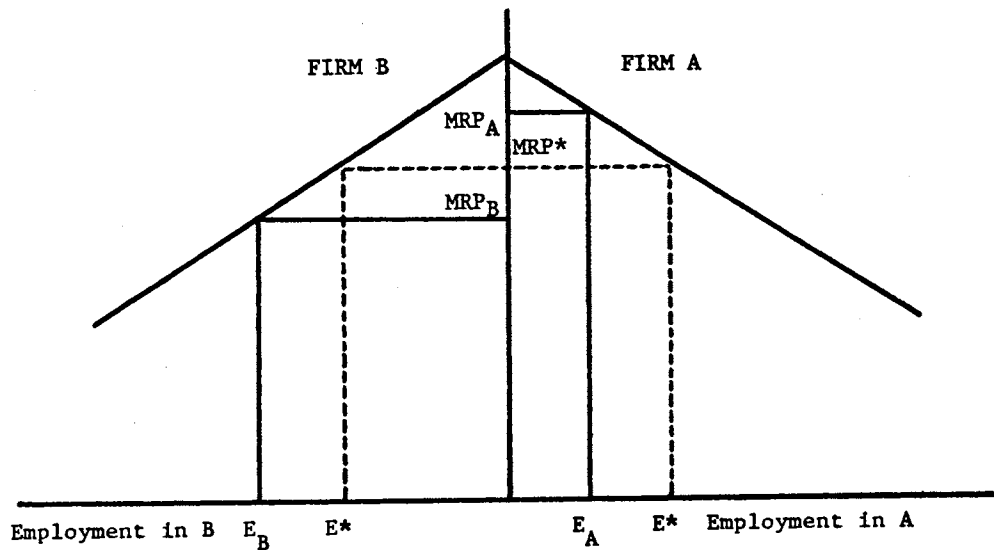
Figure 2.1 Marginal revenue products with labor supply restrictions

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[11]This result holds even if the two firms face different product demand curves. In this case the total labor force will be allocated so that w_i = MRP_i* in each firm; shifts in the level of employment in each firm will assure this result.

Under these circumstances the wage received by workers in Firm A will
be equal to MRP_A while the wage received by workers restricted to
Firm B will be equal to MRP_B. In this case the colinearity between
endogenous productivity characteristics and actual marginal revenue
product is nonexistent. The <u>endogenous revenue product</u> of each worker
is equal to MRP* while the actual marginal revenue products are
MRP_A and MRP_B.

For workers in Firm A:

$$w_i^A = MRP_A > MRP* \equiv ERP_i$$

For workers in Firm B:

$$w_i^B = MRP_B < MRP* \equiv ERP_i$$

To repeat, marginal productivity theory describes the link between
w_i and MRP_i, but fails to describe the relationship between MRP_i and
ERP_i. Thus the traditional theory cannot be used as an earnings
distribution theory where labor immobility is extensive. To summarize:

Under the assumption of perfect labor mobility:

(1) $w_i = MRP_i$

(2) $MRP_i = ERP_i$

(3) $ERP_i = f(C_j)_i$

(4) $w_i = f'(C_j)_i$.

Under the assumption of <u>imperfect labor mobility</u>:

(1) $w_i = MRP_i$

(2) $MRP_i \neq ERP_i$

$$(3) \quad ERP_i = f(C_j)_i$$

$$(4) \quad w_i \neq f'(C_j)_i$$

and the marginal productivity theory is no longer a theory of the distribution of earnings.

Human Capital Theory

Traditional marginal productivity theory rests on two fundamental assumptions: (1) homogeneous labor supply, and (2) perfect labor mobility. Institutional wage theory, to be discussed in the next section, retains the first assumption but rejects the latter. Human capital theory does the reverse. It extends the marginal productivity theory to account for differences in labor quality, but maintains that all workers of a given quality compete in the same market. In assuming no barriers to labor mobility (for labor of the same quality), the human capital theory is fully consistent with traditional wage theory. All workers who have the same endogenous productivity characteristics produce the same marginal revenue product and earn the same wage.[12] Thus

$$w_{ij} = MRP_{ij} = ERP_{ij}$$

for all individuals, i, with human capital characteristics, j. For the labor force as a whole, the distribution of earnings becomes a function of the distribution of human capital.

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[12]This holds, once again, except in the case of monopsony.

Renewed interest in the role of labor in the production process
began in the late 1950s. Edward Denison, in attempting to account
for the sources of economic growth in the United States in the
1929-1957 period, found that he could explain only 31 percent of the
increase in output if he were forced to assume that productivity of
labor did not change.[13] T.W. Schultz, in a classic article on the
same subject, showed that gains in output over time could not be
solely attributed to increases in physical capital.[14] The need arose
for a framework which stressed "human productivity" as a source of
economic growth. The idea of human capital was introduced into
economic analysis.

The new approach to the study of wages and employment did more
than merely add the dimension of labor quality to the traditional
productivity theory. It focused on the investment process by which
a given stock of human capital is accumulated. "Human capital models,"
according to Mincer, "single out individual investment _behavior_ as a
basic factor in the heterogeneity of labor incomes."[15] Empirically,
the human capital approach attempts to measure the individual and

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[13]Edward F. Denison, The Sources of Economic Growth in the United
States and the Alternatives Before Us (New York: Committee for
Economic Development, 1962), p. 266.

[14]T.W. Schultz, "Investment in Human Capital," American Economic
Review, March 1961. Also in "Investment in Man: An Economist's View,"
Social Service Review, June 1959.

[15]Jacob Mincer, "The Distribution of Labor Incomes: A Survey,"
Journal of Economic Literature, March 1970, p. 6.

social rates of return from investments in formal education, on-the-job training, vocational education, health care, additions to labor market information, and migration. Assuming away labor market imperfections, some research is even attempting to infer the distribution of abilities from the distribution of earnings.[16]

The Basic Human Capital Model

Borrowing from Mincer and Becker, the fundamental human capital equation can be written as in equation 1.

(1) $\log E_x = \log E_0 + rx$

where E_x = earnings generated by investment x

r = market discount rate or the internal rate of return on investment x

E_0 = earnings generated by other factors than investment x

According to this simple formulation the earnings distribution is a function of investments in education, training, and other individually acquired human capital components (x) plus a function of E_0 which includes innate or natural ability and other factors. Given a market determined r and assuming E_0 constant, differences in earnings will be directly related to differences in the amount of human capital acquired by each individual.

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[16]Mincer notes two articles in this genre: K. Bjerke, "Income and Wage Distribution," Review of Income and Wealth, November 1970; A.D. Roy, "The Distribution of Earnings and Individual Output," Economic Journal, September 1950.

In addition, according to Mincer, equation (1) can account for imperfections in the product market, in the labor market, and in the market for human capital investment funds. Unfortunately, however, it does this in patchwork fashion. As Mincer notes

> If the competitive assumptions are relaxed, internal rates of return cannot be equated with the market rate of interest and generally differ among individuals. Equation (1) can remain serviceable, however, with r interpreted as a group average internal rate of return on (investment x), while individual differences in r and in log E_0 are <u>impounded in a statistical residual</u>.[17] (emphasis added)

This solution to the market imperfection problem is useful as long as the degree of imperfection is minor.[18] But if a large part of the variance in individual earnings is due to labor market imperfections, the human capital model fails to specify the critical variables and in fact may draw attention away from them. A similar "error" term or shift coefficient could have been applied to the marginal productivity model, but there too, the patchwork would have been for the sake of "realism" without yielding any analytic

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[18] Two points are in order. In private correspondence, Professor Harold Levinson has noted that even this formulation by Mincer is not quite correct. The group average r may also be affected by labor market imperfections. Restrictions in supply for a whole occupation, for instance as in the case of the building trades or the medical profession, would shift r itself rather than show up in the residual. In this case, he argues, equation (1) would be assigning some portion of E_x to investment x which is in fact related to institutional factors rather than investment.

The second point regards the relationship of this formulation to the differentiation between "endogenous revenue product" and "marginal revenue product" discussed in the section on the marginal productivity theory. Clearly ERP is analogous to Mincer's "group average internal rate of return" while the "statistical residual"

improvement in the model.[19]

Reinterpreting equation (1) indicates that there are two factors

of importance in wage determination. One is the amount of investment

in human capital and the other is the rate of return earned on the

investment. Or as Thurow has formulated:

> The value of human capital can be divided into price and
> quantity components. Education and on-the-job experience
> provide the principal means for increasing the quantity or
> quality of an individual's capital. Migration, improvements
> in information, and the elimination of market imperfections,
> such as prejudice, are the chief instruments to raise the
> price for existing capital. Although the price factor
> would not exist in perfect markets where all were paid equal
> amounts for the use of identical skills, in imperfect
> markets it is an important element in valuing human
> capital.[20]

The distinction is important and lies at the crux of much confusion

over the usefulness of the human capital needed. Depending on the

degree of imperfection in the labor markets, the effect of r on E_x

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accounts for variance in MRP around ERP. In this case, r = ERP while
(MRP-ERP) = ε, the statistical residual.

[19]In the recent literature there has been some attempt at
explicitly integrating market imperfections into human capital theory.
Much of this has focused on job search behavior. The job search is
viewed as another form of investment in human capital where the costs
of the search, including opportunity costs, must be weighed against
potential discounted future earnings. While this tends to account
for the problem of "imperfect" markets due to information cost, it
fails to solve the larger problem of imperfect mobility due to market
discrimination. See Charles C. Holt and Martin H. David, "The Concept
of Job Vacancies in a Dynamic Theory of the Labor Market" (Madison:
Social Systems Research Institute, University of Wisconsin, 1965) and
Dale T. Mortensen, "A Theory of Wage and Employment Dynamics"; and
Donald A. Nichols, "Market Clearing for Heterogeneous Capital Goods,"
in Edmund S. Phelps, Microeconomic Foundations of Employment and
Inflation Theory (New York: Norton, 1970).

[20]Lester C. Thurow, Poverty and Discrimination, op. cit., p. 69.

may outweigh the effect of x. How much each individual invests in

human capital may not be as important as the rate of return he or

she receives on that investment. For a given population the distri-

bution of r's may be such as to reduce significantly the covariance

between the distribution of x's and E_x's. In this case,

> The concept of human capital loses its economic meaning.
> It no longer reflects productive capacities, and it no
> longer can be viewed in the same light as physical capital.
> In a fundamental sense the problems of determining individual
> incomes cease to be economic and become sociological or
> institutional.[21] (emphasis added)

Empirical Studies of the Human Capital Earnings Function

The development of the human capital function was followed by

a steady flow of empirical studies aimed at quantifying the deter-

minants of earnings. Many of the earlier studies attempted to measure

the private and social returns to education by estimating the

discounted present value of investment in formal schooling.[22] Other

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[21]Lester Thurow, Investment in Human Capital, op. cit., p. 18.

[22]Some of the more important studies in this area include:
Gary Becker, Human Capital (New York: National Bureau of Economic
Research, 1964); W. Lee Hansen, "Total and Private Rates of Return on
Investment in Schooling," Journal of Political Economy, April 1963;
Orley Ashenfelter and J.D. Mooney, "Some Evidence on the Private
Returns to Graduate Education," Southern Economic Journal, January
1969; M. Blaug, "The Private and Social Returns to Investment in
Education: Some Results for Great Britain," Journal of Human Resources,
Spring 1967; A.B. Carroll and L.A. Ihnen, "Costs and Returns for Two
Years of Postsecondary Technical Schooling," Journal of Political
Economy, December 1967; W. Lee Hansen, Burton Weisbrod, and W.J.
Scanlon, "Schooling and Earnings of Low Achievers," American Economic
Review, June 1970; E.F. Renshaw, "Estimating the Returns to Education,"
Review of Economics and Statistics, August 1960; E.A.G. Robinson and

studies more explicitly analyze the distribution of income and

earnings with human capital factors as the independent variables.

Using diverse earnings functions, a number of studies have

attributed a large part of the explained variance in incomes to

differences in education. Morgan, David, Cohen, and Brazer, using

multiple classification analysis on national survey data, found the

most important factor determining hourly earnings of household heads

is an education-age interaction term.[23] The beta coefficient on the

education-age term was .234, highest among the fourteen variables in

their analysis including sex, occupation, race, geographic mobility

and several general demographic factors.[24] Using the 1/1000 1960

Census sample, Giora Hanoch finds a relatively high "marginal product"

for education, although education appears in his formulation to be

subject to diminishing returns.[25] The result is similar to Weisbrod's

findings for private rates of return on different levels of schooling.

J.E. Vaizey (eds.), The Economics of Education (London: St. Martins, 1966); Gerald Rose, Differential Returns to Investments in Human Capital in the Academic Labor Market, University of California (Unpublished Ph.D. dissertation, 1969).

[23]James N. Morgan, Martin H. David, Wilbur J. Cohen, and Harvey E. Brazer, Income and Welfare in the United States (New York: McGraw-Hill, 1962).

[24]Ibid., p. 48.

[25]See Giora Hanoch, "Personal Earnings and Investment in Schooling," Ph.D. dissertation, University of Chicago, 1965; also, "An Economic Analysis of Earnings and Schooling," Journal of Human Resources, Winter, 1967.

Lowell Gallaway,[26] H.S. Houthakker,[27] Elizabeth Waldman,[28] and

Herman Miller[29] have all attached a great significance to formal

education in explaining the distribution of earnings.

More recently, however, a good deal of research has called

into question the great importance of formal education in earnings

functions. This is especially true of studies directed at explaining

the income differences of whites and nonwhites. Using a 77 cell

education-occupation matrix, Bluestone et al. find that a maximum of

30.3 percent of the income differential between full-time, full-year

employed white and black men can be explained by the quantity of

formal schooling.[30] Two-thirds or more of the differential is due

to occupational discrimination (education statistically held constant),

discrimination in industrial attachment, and human capital factors

not included in formal schooling. Only 2.8 percent of the total

differential between full-time employed white men and white women can

[26]Lowell Gallaway, "The Negro and Poverty," Journal of Business, January 1967, pp. 27-35.

[27]H.S. Houthakker, "Education and Income," Review of Economics and Statistics, February 1959.

[28]Elizabeth Waldman, "Educational Attainment of Workers," Monthly Labor Review, February 1969.

[29]Herman P. Miller, "Annual and Lifetime Income in Relation to Education," American Economic Review, December 1960.

[30]The calculations were made from data obtained in the 1967 Survey of Economic Opportunity. These specific calculations can be obtained from the authors. Similar results in a more disaggregated model can be found in Barry Bluestone, Mary H. Stevenson, and William M. Murphy, Low Wages and the Working Poor (Ann Arbor: Institute of

be explained by formal schooling; 14 percent of the differential

between black women and white men. Donald Katzner found a similar

result for the white/nonwhite earnings differential.[31] Michelson,

criticizing earlier studies for failing to account correctly for the

interaction between education and occupation, finds the effect of

schooling on earnings to be even smaller.[32] Using a larger matrix,

Michelson shows "that only 16 percent of the earnings differential

between whites and nonwhites would have been corrected by equal

schooling categories, employing current (1959) earnings per year of

school for each racial group."[33]

In response to the evidence that formal schooling explains only

a fraction of the earnings differential, especially among race-sex

groups, additional human capital variables have been added to the

earnings function. A catalog of these variables compiled by Hansen,

Weisbrod, and Scanlon includes: (1) physical condition, including

general state of health and specific disabilities; (2) mental

capability, reflecting inherited potential; (3) learning and

experience, determined not only by the quantity and quality of formal

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Labor and Industrial Relations, Research Division, University of
Michigan-Wayne State University, 1973).

[31]Donald A. Katzner, Theory and Cost of Racial Discrimination,
Ph.D. dissertation, University of Pennsylvania, 1966.

[32]Stephan Michelson, Incomes of Racial Minorities (Washington:
The Brookings Institution, 1968) unpublished manuscript.

[33]Ibid., pp. 2-35.

education, but by specific job training and job experience; (4)

psychological characteristics, among them motivation and ability to

communicate and cooperate in work situations; and (5) family

environment, reflecting informal learning, socialization, and

"contacts."[34]

The study by Morgan, et al. attempted to explain hourly earnings

using proxies for many of these factors. While "supervisory

responsibility," "attitude toward hard work and need-achievement

score," "interviewers' assessment of ability to communicate," and

"physical condition" were statistically significant, each of these

factors explained only a minute fraction of the variance in wage

rates after controlling for other variables.[35] Altogether their

fourteen variables including education and age, sex, occupation, race,

and geographical location (in addition to the preceding variables)

accounted for 34 percent of the variance in wage rates. Two-thirds

remained unexplained.

Other researchers have continued to add new variables to the

basic human capital model in an attempt to explain the variance in

earnings. Chief among these are the quality of education, work

experience, and on-the-job training. Johnson and Stafford used

educational expenditure per pupil as a proxy for "quality" and found

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[34]W. Lee Hansen, Burton A. Weisbrod and William J. Scanlon, "Determinants of Earnings: Does Schooling Really Count?" Discussion Paper, Institute for Research on Poverty, University of Wisconsin, August 1968 (Preliminary Draft).

[35]Morgan et al., Income and Welfare in the United States, Chapter 5.

"that there are high but diminishing marginal returns to investment

in school quality."[36] Thurow has used years of experience in the

labor force as a proxy for "experience" or on-the-job training.[37] Rees

and Shultz find "seniority" with the present employer to be the most

significant variable in explaining the wages of workers in their

Chicago labor market study.[38] The use of "age" in other studies is

intended to act partially as a proxy for experience. In each case,

age, experience, general on-the-job training, or seniority has been

found significant. Yet with few exceptions even the most complete

human capital equation seldom explains more than 35 percent of the

variance in income and usually the explanatory power of such models,

measured in terms of R^2, is much lower.

Of course, a relatively high R^2 only indicates correlation; it

indicates nothing about the causal nature of the relationship or even

the direction of causation. This is especially important for human

capital functions. In the case of experience, for instance, the

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[36]George E. Johnson and Frank P. Stafford, "Social Returns to Quantity and Quality of Schooling," Department of Economics, University of Michigan, 1970, unpublished manuscript, pp. 17-18. Other works on school quality as an input in the human capital equation include: Finis Welch, "Measurement of the Quality of Schooling," _American Economic Review_, May 1966; and James Morgan and Ismail Sirageldin, "A Note on the Returns to Quality of Schooling," _Journal of Political Economy_, September-October 1968.

[37]Lester C. Thurow, "The Occupational Distribution and Returns to Education and Experience for Whites and Negroes," _Federal Programs for the Development of Human Resources_, Joint Economic Committee (Washington, D.C., 1968), pp. 267-84.

[38]Albert Rees and George B. Shultz, _Workers and Wages in an Urban Labor Market_ (Chicago: University of Chicago Press, 1970), pp. 84-85.

problem is severe. There are a number of interpretations of the
relationship between experience and earnings, all of which are con-
sistent with the data, but which point to extremely different hypotheses
about the determinants of income. One is that experience adds
directly to a worker's endogenous revenue product and therefore is a
legitimate human capital variable. Another, however, views experience
or seniority as reflecting nothing more than institutionalized pay
increments based on length of service and set out in collective
bargaining agreements or offered by employers to maintain morale. In
this case, "experience" may be totally unrelated to changes in an
individual's human capital.

Of even greater damage to the human capital interpretation of
"experience" is the possibility that the causal link between earnings
and experience may actually be reversed. Higher wages may cause
longer experience. Workers in "high wage" industries may have lower
turnover rates and therefore longer on-the-job experience because there
is little room for improving earnings by moving to new employment.
Workers in "low wage" industries or firms may feel less attachment
to their present employer and search often for new jobs. In this case
seniority may be low, but possibly the result of low wages rather than
the reverse.[39] In addition, the existence of "internal labor markets"

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[39]Doeringer has shown that this occurs often in ghetto labor
markets. In a study of a Boston manpower program, he found that job
tenure was directly related to wage level after controlling for other
factors. See Peter B. Doeringer, "Manpower Programs for Ghetto Labor
Markets," Proceedings of the 21st. Annual Winter Meeting of the
Industrial Relations Research Association, pp. 257-267.

produces a situation where training and experience become a function

of being hired.[40]

Similar problems of interpretation exist with other human

capital variables as well. The relationship between years of formal

schooling and level of human capital is by no means clear. Bowles,

for instance, has begun work on educational production functions to

determine what inputs from formal schooling contribute to "pro-

ductivity."[41] Of special concern is whether schooling actually con-

tributes to the endogenous revenue product of the individual or whether

the empirically derived relationship between education and earnings

merely reflects the use of formal schooling as a "credential" in the

employment screening process. Other human capital variables suffer

the same problems of interpretation. General and specific job

training, IQ scores, health and disability measures, and factors

contributing to geographical mobility all appear to contribute in one

way or another to the "explanation" of earnings. But the precise

connection between independent and dependent variables remains fuzzy.

The more important problem with the human capital theory remains,

however, even if the problem of causal relationships is set aside.

Like its predecessor in productivity theory, human capital models fail

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[40]For the best discussion of internal labor markets, see Peter B. Doeringer and Michael J. Piore, Internal Labor Markets and Manpower Analysis (Lexington: D.C. Heath, 1971).

[41]See Samuel Bowles, "Towards an Educational Production Function," in W. Lee Hansen (ed.), Education, Income and Human Capital (New York: National Bureau of Economic Research, 1970).

as a theory of personal earnings where labor markets are imperfect. The use of "race" and "sex" variables as human capital components or "quality" variables clearly improves the fit of so-called human capital functions. But it should be equally clear that such variables are quite distinct from what we have called "endogenous productivity characteristics." Where racial and sexual discrimination exist in the labor market, or where mobility barriers are established through monopsonistic power or trade union practice, the distribution of wage income and the distribution of endogenous revenue products need not be covariant. In this case explicit attention must be paid to the institutional factors in the economy which impinge on the distribution of earnings. If mobility barriers are important in the economy, the ad hoc addition of new "human capital" variables may boost R^2 a bit, but will add little to a meaningful explanation of wage determination.

The Institutional Approach

Whereas the marginal productivity theory and human capital theory for the most part ignore the existence of barriers to labor mobility, the institutional approach to wage theory begins with the basic position that market imperfections are sufficiently widespread to cause wage rates to deviate significantly from their free market equilibrium levels. Thus, according to institutional theory, an individual's actual marginal revenue product can diverge significantly from his endogenous revenue product.

The institutional approach, developed in the late 1930s, came
in response to rising unionism, a growing awareness of monopoly
elements in the economy, and increased government intervention in the
marketplace. Rather than an immediate concern with the determinants
of individual earnings, institutional theory has attempted to untangle
the various factors which impinge on interindustry and interregional
wage distributions. Where the marginal productivity theory focused
on _absolute_ wage levels, the institutionalists have been more con-
cerned with _relative_ wages (and changes in relative wages) for similar
work. Assuming the "quality" of labor homogeneous within a given
occupational range, the institutional approach investigates the impact
of such factors as unionization and the effect of "ability to pay" on
relative wages. Lacking the theoretical rigor of other approaches
to wage determination, the institutional approach compensates with
vigorous empirical investigation.

Balkanized Labor Markets

Adam Smith attempted to explain wage differentials by noting
"compensating" differences in job content. In contrast, J.S. Mill
argued as early as 1847 that wage differentials are due to the absence
of competition in the market for labor.[42] Stressing the existence of

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[42]J.S. Mill, The Principles of Political Economy with Some of
Their Applications to Social Philosophy in Vol. II, Collected Works
of John Stuart Mill (Toronto: University of Toronto Press, 1965).
According to Mitchell, the first reference to "noncompeting" groups
in labor is found in Mill's lecture notes. See Wesley C. Mitchell,
Types of Economic Theory, Vol. I (New York: Augustus M. Kelley, 1967),
p. 562n.

barriers to occupational entry, Mill pictured the labor market as deeply fragmented with individual workers falling into specifically defined markets. Little intermarket mobility could be expected between "noncompeting" groups of labor. Barriers to mobility between occupations, in Mill's view, were due to the social class structure of what we would today call human capital investment behavior.

The theme of barriers to labor mobility is implicit in the institutional analysis. But in place of strict family occupational lines characteristic of a preindustrial era, the modern labor market is "bulkanized" or segmented into many sub-markets by institutionally developed rules, both formal and informal.[43] Entrance into each sub-market, and movement within its internal market channels are often strictly defined. The degree of unfettered choice within the overall labor market is consequently diminished. Those who gain access to restricted markets presumably gain wages higher than they normally would in the face of perfect competition.

Restriction of employment in any one sub-market or firm occurs in one of two ways (or both). In markets controlled by strong employee organizations (e.g. building trades, the medical profession) the actual supply of labor may be restricted to some given level. The intersection between the market demand curve and the "institutionalized" supply curve yields the sub-market wage. In other markets,

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[43]See Clark Kerr, "The Bulkanization of Labor Markets," in E. Wight Bakke, Labor Mobility and Economic Opportunity (Cambridge: The New Technology Press and John Wiley, 1954).

supply is not explicitly regulated, but the wage level is. In this case the amount of labor employed in the sub-market is a function of sub-market demand and the institutionally set wage. In both cases it is presumed that the resulting wage exceeds the wage that would exist in perfect competition.

The existence of strong unions on the labor supply side is an important element in the institutional framework. Yet other factors which contribute to the bulkanization of labor markets--racial and sexual discrimination, barriers to geographical mobility, "lock-in" effects of seniority, civil service channels, etc.--contribute to the institutionalist argument that wage rates may reflect other factors beside the endogenous productivity characteristics of labor.

Balkanized labor markets, however, are only part of the institutionalist approach to wage theory. On the demand side, institutionalists argue that firms do not profit maximize, that the marginal conditions needed to maximize profits are not and cannot be known with accuracy, and that firms have other goals with respect to their workforces beside maximizing output at minimum labor cost.[44] Instead of reflecting the lowest wage possible in every instance, firms with an "ability to pay" will often offer higher wages than necessary to secure the quantity of a given quality of labor it desires. In the

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[44]For the best summary of the institutionalist attack on marginal productivity theory and for one of the strongest rejoinders, see the Richard Lester-Fritz Machlup "debate." This appears in three issues of the American Economic Review, March 1946, September 1946, and March 1947.

words of a leading institutionalist, "The major factor [in wage determination] is differences in companies' wage-paying ability, plus in some cases the presence of a union which forces a company closer to the limit of its ability to pay."[45] This stress on "ability-to-pay" has led many empirical studies to focus on those factors related to the well-being of a firm or industry: concentration, profits, capital-intensity, and productive efficiency. Unionization takes on the role of a political power variable in addition to its role in restricting labor supply.

An Institutional Model of Wage Determination

Pulling together the separate strands of institutional wage theory allows the development of a unified institutional theory of wage determination.[46] Labor supply is assumed homogeneous in quality but

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[45]Lloyd Reynolds, The Structure of Labor Markets (New York: Harper and Brothers, 1951), p. 189.

[46]Some of the more important research which went into the institutional synthesis included: John Dunlop, Wage Determination Under Trade Unions (New York: John Wiley, 1944); Arthur M. Ross, Trade Union Wage Policy (U. of California, 1948); Harold M. Levinson, Unionism, Wage Trends, and Income Distribution, 1914-1947 (Ann Arbor: University of Michigan Press, 1951); Lloyd G. Reynolds, The Structure of Labor Markets (New York: Harper and Brothers, 1951); Sumner Slichter, "Notes on the Structure of Wages," Review of Economics and Statistics, February 1950; Lloyd G. Reynolds and Cynthia H. Taft, The Evolution of Wage Structure (New Haven: Yale University Press, 1956); William Bowen, Wage Behavior in the Postwar Period (Princeton: Princeton University, Industrial Relations Section, 1960); Harold M. Levinson, Postwar Movement of Prices and Wages in Manufacturing Industries, Joint Economics Committee, 86th Congress, 2nd Session, Study Paper No. 21, 1960; Albert Rees, "Union Wage Gains and Enterprise Monopoly," Essays on Industrial Relations Research (Ann Arbor: University of Michigan,

balkanized by factors other than those related to endogenous

productivity characteristics. Product markets are differentiated by

entry barriers, either accounted for by scale requirements or spatial

area limitations.[47] And unions are responsible for either directly

limiting labor supply or using their bargaining power to raise wage

levels above the competitive norm.

Wages are then determined through a complex interaction of

economic constraints, political decisions which affect the strength of

unionism, and finally the relative bargaining power of labor and

management.[48]

INDUSTRY WAGE DIFFERENTIALS

ECONOMIC FACTORS ←——→ BARGAINING POWER FACTORS

POLITICAL FACTORS
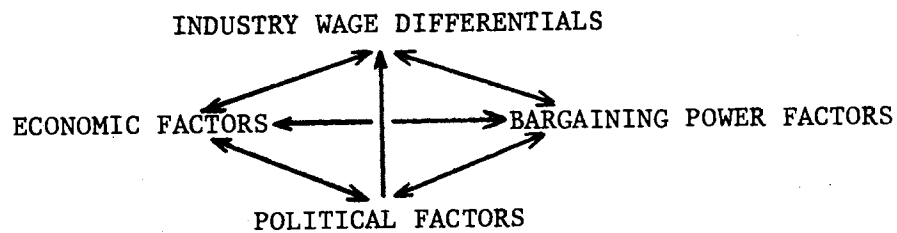
At any given point in time, the general level of physical productivity

and market demand conditions place an upper limit on the final wage

Institute of Labor and Industrial Relations, 1961); H. Gregg Lewis, Unionism and Relative Wages in the United States (Chicago: University of Chicago Press, 1963; Harold M. Levinson, "Unionism, Concentration, and Wage Changes: Toward a Unified Theory," Industrial and Labor Relations Review, January 1967; Harold M. Levinson, Determining Forces in Collective Wage Bargaining (New York: John Wiley, 1968).

[47]The argument about spatial limitations of the physical area of a labor market is developed in Harold M. Levinson, "Unionism, Concentration, and Wage Changes: Toward A Unified Theory," op. cit.

[48]This model is most thoroughly discussed in Harold M. Levinson, Determining Forces in Collective Wage Bargaining, op. cit.

bargain. The hypothetical competitive labor supply curve places the lower limit on the wage bargain. The final wage settlement will then lie within this range and be determined by the relative bargaining power of employer and employee representatives and/or the nature of the preference function of management where union strength is either weak or nonexistent.

The institutional synthesis can be depicted as in Figure 2.2. In the short run, firms are faced by a wage range, $W_C - W_M$, where W_C is the reserve price of labor (of a given quality) in the absence of any restriction of labor supply. At a wage below W_C, firms will find no one willing to work. Above W_M, firms will cease all production because $W_M > MRP$ at all levels of output. Through collective
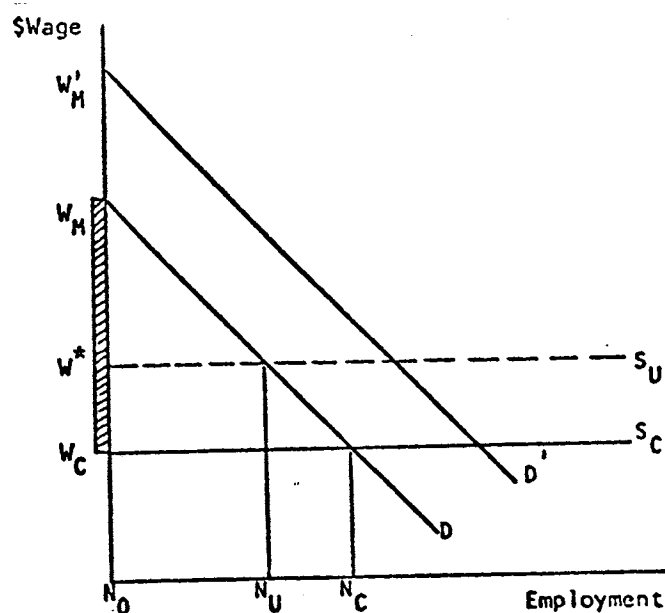
Figure 2.2 The institutionalized wage bargain

bargaining, the labor supply curve will be raised vertically so that

the height of S_U above W_C depends on the relative bargaining strength

of labor and management. Increases in the marginal physical product

of labor (through increases in the capital/labor ratio or techno-

logical advances) or increases in marginal revenue (due to changes in

market demand conditions) will shift the MRP curve up and the wage

band will expand to $W_C - W_M'$. The final wage W* thus depends on economic

variables (marginal physical product and marginal revenue) and

bargaining power factors. Behind the scenes, the government plays a

political role in modifying the relative strength of labor and

management.[49]

Even with homogeneous labor supply, wage rates can differ

between firms or industries depending on the relative height and slope

of the marginal revenue product curves and the relative strength of

labor and management. The institutional model consequently predicts

the following results:

(1) Individuals barred from protected industries will earn lower

wages than individuals in other industries even where endogenous

revenue products are equal.

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[49]In the long run W* is indeterminate without knowledge of the
elasticity of substitution between capital and labor. Autonomous
increases in the price of labor may drive firms to raise the capital-
intensity of their production processes. In this case, the S_U curve(s)
and demand curves will no longer be independent. The precise wage
outcome requires information about the elasticity of substitution
between capital and labor and the wage preference function of union
leadership.

(2) Wages will reflect industry characteristics as well as the endogenous productivity characteristics of the workforce.

(3) In particular wages of similarly qualified individuals will be higher for those who gain access to unionized industries and industries where competitive pressures are minimized through monopoly or spatial limitations to market entry.

Empirical Verification of the Institutional Approach

With few exceptions data on manufacturing industries have been used to test the institutional predictions. The usual dependent variable is change in average straight-time hourly earnings over time.[50] The critical independent variables have been unionization and concentration while some attention has focused on profits, change in sales, value-added, and capital-labor ratios.[51]

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[50] Changes or increases in average wage rates rather than absolute wage levels have been used in institutional analyses in order to circumvent the problems caused by differences in the "quality" of the labor force in different industries. Presumably while labor quality may vary from industry to industry, changes in the average endogenous productivity of an industry's workforce come only slowly. Thus there should be little relationship between changes in wage rates and changes in the quality of the labor force. Any significant correlation between industry factors and changes in wage rates should consequently be free of hidden correlation with human capital variables. Unfortunately this does not completely solve the problem, however.

[51] For early work using some of these industry factors see: Sumner Slichter, op. cit.; John T. Dunlop, "Productivity and the Wage Structure," in Income, Employment and Public Policy, Essays in Honor of Alvin H. Hansen (New York: Norton, 1948); Joseph Garbarino, "A Theory of Inter-Industry Wage Structure Variation," Quarterly Journal of Economics, May 1950.

In an analysis of data for the 1923-40 period, Garbarino found a zero-order correlation of .7702 between the rate of increase in earnings and the degree to which output is concentrated in a few firms.[52] In a similar study of 50 industries covering the period 1933-1946 Ross and Goldner found a very strong correlation between concentration and changes in average straight-time hourly earnings.[53] Significant positive relationships were also found with unionization and growth in employment, although Ross and Goldner admitted that they could not disentangle the independent effects of concentration, employment growth, and unionization. They concluded that concentration and growth provide a "permissive" economic environment within which unions can appropriate a portion of monopoly profits. In a later multiple regression analysis, Bowen confirmed the difficulty of untangling the institutional variables, but found that wages rose more rapidly in industries with rising employment, higher profits, higher concentration ratios and stronger unionization.[54] Finally Levinson confirmed the importance of profits, concentration, and unionization.[55] He found a strong relationship between earnings, lagged profits, and 1954 concentration ratios, but found no general relationship between union

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[52]Joseph Garbarino, op. cit., p. 302.

[53]Arthur M. Ross and William Goldner, "Forces Affecting the Interindustry Wage Structure," Quarterly Journal of Economics, May 1950.

[54]William Bowen, op. cit.

[55]Harold Levinson, Post-War Movement of Prices and Wages in Manufacturing Industries, op. cit.

strength and wage changes. The importance of union strength per se, he argued, does not show up statistically, but nevertheless exists through pattern and demonstration effects.

H. Gregg Lewis has derived numerous estimates of the effect of unionization in different sectors of the economy for different historical periods.[56] Most of these estimates use data compiled by a number of his students. Using data developed by Sobotka, Lewis estimated that in 1939 uniorization increased wages of common laborers in the building construction industry by approximately 5 percent. Skilled craftsmen, however, members of much stronger unions, were able to raise their relative wage 25 percent through organizing.[57] In bituminous coal, the effect of unionism ranged from a high of over 120 percent in the early 1920s to zero at the end of World War II.[58] The effect of unionization on relative wages in other industries included 10-18 percent in rubber tire manufacturing (1948), 7 percent in wooden furniture manufacture (1950), 19 percent for barbers (1954), and 6-10 percent for hotel employees (1948).

The weighted average effect of unionism on wages in the 12 industry studies Lewis reviewed is 18 percent. In cross-industry

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[56] H. Gregg Lewis, op. cit.

[57] The construction industry estimates derived by Lewis are based on Stephen Sobotka, "The Influence of Unions on Wages and Earnings of Labor in the Construction Industry," Ph.D. dissertation, University of Chicago, 1952.

[58] Based on Rush V. Greenslade, "The Economic Effects of Collective Bargaining in Bituminous Coal Mining," Ph.D. dissertation, University of Chicago, 1952.

global studies of interindustry wage variation, Levinson,

Garbarino, and Goldner found an effect of similar magnitude while

Ross and Ross and Goldner found a somewhat smaller effect (although

biased by the 1945-46 period). Levinson's estimate was in the

neighborhood of 17 percent while Garbarino and Goldner were closer to

15.[59]

Problems with The Institutional Approach

In relaxing the assumption of labor mobility inherent in tra-

ditional wage theory, the institutional approach should be an important

addition to an understanding of wage determination. Unfortunately,

however, there are a number of problems in institutional analysis which

detract from its general usefulness.

One of these is the difficulty in specifying and measuring such

abstract factors as "ability-to-pay" and "bargaining power." The use

of profit rates and concentration clearly do not serve as strong

proxies for either of these and the proportion of employees covered by

collective bargaining agreements--the normal measure of "unionization"--

certainly leaves something to be desired as a measure of restricted

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[59]These estimates were derived by Lewis by correcting the
earlier estimates in the original studies in order to make them con-
sistent. For the detail on these studies, see, Harold M. Levinson,
"Unionism, Wage Trends, and Income Distribution, 1914-1917," Michigan
Business Studies (Ann Arbor: Bureau of Business Research, Graduate
School of Business, University of Michigan, 1951); Joseph W. Garbarino,
op. cit.; William Goldner, "Labor Market Factors and Skill
Differentials in Wage Rates," Industrial Relations Research Association,
Proceedings of the Tenth Annual Meeting, 1958, pp. 207-16.

labor supply or bargaining power. Consequently even if industry

characteristics seem able to account statistically for differences

in wage levels or changes in wage levels, it is difficult to relate

the results of the reduced form equation to a specific theory of wage

determination.

A second problem, at least for present purposes, is that insti-

tutional wage theory does not account for the stratification of certain

workers into certain industries. It generally assumes imperfect

mobility without specifying the parameters of stratification. While

there is some theory as to why certain industries become concentrated

or unionized, there is practically no hypothesis as to which workers

will be employed in the more unionized industries and which in more

competitive sectors of the economy. This problem, of course, stems

from the fact that institutional theory never was intended as an

explicit theory of the personal earnings distribution.

There is an additional problem, however, which is potentially

more serious than either of these. It is possible that the insti-

tutional model is partially misspecified.[60] The correlation between

earnings and institutional variables may be partly spurious hiding a

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[60]The term "misspecified" in this context does not simply refer
to the fact that one or more variables in the model may be specified
in the wrong mathematical form (e.g. linear rather than log normal).
Rather misspecification refers to the possibility that there does
not exist a real causal relationship between the endogenous variable
and the several exogenous factors. In this case the significant
correlation found between variables is spurious. A correctly
specified model would be one in which the causal relationship between
variables is theoretically sound.

correlation between earnings and endogenous productivity character-

istics. Misspecification may result because of the sequential

ordering of the acquisition of human capital, the determination of

occupation and industry, and the receipt of earnings. If occupational

and industrial attachment is a function of the level of human capital,

some of the variance in earnings normally attributed to industry

characteristics may in fact be due to differences in human capital

factors correlated with industry variables, but unspecified in insti-

tutional models. More formally, to the extent that (1) this corre-

lation exists and (2) the acquisition of human capital is causally

prior to job placement, significant coefficients on industry variables

are spurious and due to errors in the specification of the institutional

model. In the extreme case, the true relationship is between human

capital and earnings and the institutional model vanishes.

The use of data on wage changes rather than wage levels does not

completely eliminate this problem. The extent of unionization or

concentration across industries may be perfectly colinear with the

industry distribution of human capital. In this case both industry

and human capital variables would equally describe interindustry wage

changes and there would be no way a priori to determine which is the

true relationship. It may be true that larger wage increases as well

as higher wage levels are accorded higher skilled workers.

A fair test of the effect of institutional variables thus

requires a model which explicitly accounts for differences in human

capital and furthermore specifies the relationship between industry

factors and endogenous productivity characteristics. Such a model

would improve our understanding of interindustry wage differentials.

To go even further and develop a complete and coherent theory of the

distribution of personal earnings requires additional information

on the social stratification process in labor markets.

Social Stratification Analysis

Sociological literature since the time of Marx is replete with

attempts to understand the development and structure of social

stratification. Marx's theory of class conflict placed stratification

at the root of all social change.[61] He viewed man's relation to the

means of production as the primary determinant of economic structure

and class differentiation. Emile Durkheim similarly placed great

emphasis on the division of labor.[62] Increasing social density, he

argued, led to increasing occupational differentiation, lessened

social consensus, and altered the nature of social solidarity.

Other sociologists have studied the nature of status and prestige.

Weber investigated the relationship between social and economic

orders, stressing the importance of status as differentiated from

economic standing.[63] Others have attempted to distinguish the

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[61]For an excellent review of Marx's theory of class differ-
entiation, see Reinhard Bendix and Seymour M. Lipset (eds.), Class,
Status and Power, "Karl Marx's Theory of Classes" (Glencoe, Free
Press, 1953), pp. 6-12.

[62]Emile Durkheim, On the Division of Labor in Society (New York:
Macmillan, 1933).

[63]Max Weber, "Class, Status, and Party," in Max Weber, Essays in
Sociology (New York: Oxford University Press, 1946).

differences between class, status, and prestige. Within this broad

thrust is a more specific inquiry into the roots of social and

occupational mobility.[64]

For present purposes, a narrower perspective on social strati-

fication is necessary. A general theory of the personal earnings

distribution requires that the mechanisms of occupation, industry,

and wage stratification be clearly described. While this cannot be

done here in detail, a brief taxonomy of economic stratification is

helpful.

Two distinct mechanisms of differentiation can be identified.

One follows from human capital theory and the other from the insti-

tutional analysis. The former relates to differential access to human

capital; the latter to differences in the rates of return on a given

set of endogenous productivity characteristics. Both are related to

differences in race, sex, and social class.[65]

(1) Access to human capital. Investment in human capital can

vary between individuals for numerous reasons. Differences in time

preference, for one, can make a large difference in how much and when

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[64]See, Pitirim A. Sorokin, Social Mobility (New York: Harper,
1927). For a review of social mobility studies, see S.M. Miller,
"Comparative Social Mobility," Current Sociology, 1960.

[65]By the term "social class" we shall refer to a group of
individuals who generally possess common economic and social character-
istics. The key determinants of social class by this definition include
income, wealth, consumption, and social status. Social status is
normally conferred through one's occupation. The intergenerational
transfer of "social class," for empirical purposes, is measured by
occupational standing and/or income.

individuals invest in themselves. Differences in ability may affect

investment rates as well. Individuals with greater innate ability,

for instance, may tend to remain in school longer and invest in more

training especially if training and ability interact to produce

extraordinary returns. Differences in income-leisure preference may

also tend to differentiate human capital investment. In each of these

cases, differential amounts of investment may be said to be

"voluntary."[66]

There are other cases, however, where differential investment is

involuntary and reflects social stratification. Because human capital

investment funds are not a "free" good and the market for investment

funds is imperfect, social class, race, and sex can enter into the

determination of each individual's stock and structure of acquired

human capital. The level of private investment often reflects the

level of personal income while the level of social investment (e.g.

through public schools) is dependent on the social stratification

among legal jurisdictions.

Given imperfect human capital markets, wages can differ con-

siderably among individuals even if innate abilities and personal

preferences are identical, product and labor markets are perfect, and

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[66]Extreme caution must be exercised in the use of the term
"voluntary." An individual's time preference, for instance, probably
depends on a whole set of factors, many of which he cannot control.
Family attitudes, the social millieu, and economic conditions may
all play a role in determining an individual's time preference and
income-leisure trade-off. "Culture" obviously influences a person's
motivation and may well be associated with social class.

rates of return are equivalent everywhere for identical levels of

human capital. Under these conditions, if access to human capital

is influenced by such characteristics as race, sex, and social class,

wage differentials will reflect these factors.

(II) <u>Differential rates of return</u>. Differential amounts of

investment are sufficient to produce a stratified wage structure. Yet

there is considerable evidence that suggests that wage rates differ

extensively among individuals with similar endogenous productivity

characteristics. These wage differentials can be viewed as differences

in the rate of return on human capital investment.

Some of these differences may be related to traditional insti-

tutional factors such as unionization, concentration, spatial barriers

to market entry, and imperfect information. Beyond this, however,

lies the effect of social stratification on the structure of labor

supply. Rather than randomly distributed, rates of return seem to be

significantly related to race and sex. Discrimination in the labor

market can take a number of different forms each contributing in a

distinct way to differentiating rates of return.[67]

Wage rates (or rates of return) can differ among two individuals

who perform precisely the same job in the same firm. This type of

differential might be termed "pure wage discrimination." The more

complicated forms (and possibly the more pervasive) involve restricted

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[67]Thurow has attempted to catalog the several types of discrimi-
nation found in the labor market and analyze the effect of each. His
"catalog" can be found in Lester C. Thurow, <u>Poverty and Discrimination</u>,
<u>op. cit.</u>, p. 117.

access to particular industries, occupations, or firms. Occupational

and industrial stratification will result in different rates of return

for the same endogenous productivity characteristics and thus play a

potentially important role in the distribution of personal earnings.

How important restricted access is in determining the distribution

of rates of return can only be ascertained through empirical investi-

gation.

Social Stratification and Wage Theory

Taken to its extreme, social stratification theory stands in

direct contrast to neoclassical theory. Where the traditional analysis

focuses on maximization behavior subject to economic constraints,

stratification analysis ultimately places responsibility on the

"constraints" for determining economic outcomes. In terms of the

personal distribution of earnings, the key variables in social strati-

fication theory are beyond the control of the individual. To summarize,

they include:

    (1) Opportunity for private investment in human capital
    (2) Opportunity for social investment in human capital
    (3) Restrictions to entry into specific occupations
    (4) Restrictions to entry into specific industries
    (5) Job discrimination within individual firms
    (6) Wage discrimination within individual jobs

By allowing these factors to enter the formulation of wage

theory, two things are accomplished. First, the barriers to mobility

stressed in the institutional analysis ("noncompeting" groups,

imperfect labor market information, unionization, and spatial

limitations to entry) are extended to include the obviously important factor of discrimination in the labor market. Second, the inclusion of the social stratification variables provides a framework for understanding the specific distribution of jobs and earnings over the distribution of persons. Traditional human capital theory fails to adequately explain the distribution of endogenous productivity characteristics while traditional institutional analyses fail to specify which individuals will gain access to which sectors of the economy. Social stratification theory thus may provide part of the answer necessary to close the system used to explain personal earnings.

There is one important problem with stratification analysis, however. Taken alone it provides no more than a <u>description</u> of the wage distribution at a given point in time. In this sense it is not a "theory" of wages per se. Its key parameters, race, sex, and social class, are not particularly useful by themselves in analyzing <u>changes</u> in the distribution of earnings. Consequently, stratification analysis must become part of a more general theory of earnings if the theory is to yield any more than a static description.

<div align="center">

<u>Toward a Complete Theory of</u>
<u>Wage Determination</u>

</div>

Each of the four existing theories of wages, at least in its "pure" form, exhibits at least one critical shortcoming which prevents it from fully explaining the observed distribution of earnings. Marginal productivity theory fails to account for differences in endogenous productivity characteristics and for barriers to labor

mobility. Human capital theory, while rectifying the problem posed by a heterogeneous labor force, fails to pay adequate attention to labor market imperfections. Institutional analysis focuses on the economic results of market imperfection, but fails to adequately control for differences in human capital or describe adequately the personal characteristics responsible for differential access to labor sub-markets. Finally, social stratification analysis, which neither assumes homogeneous labor supply or perfect labor markets, is greatly weakened by its inability to describe the dynamics of wage determination.

Yet each theory provides a potentially vital element in the construction of a general wage model. Productivity theory indicates that on average wages will bear a close relationship to labor's marginal product. Further describing the supply side of labor markets, human capital theory predicts that relative earnings will be related to investment in endogenous productivity characteristics. Institutional theory poses the possibility that labor market imperfections will impinge on the wage determination process in such a way that the distribution of earnings (for individuals with similar human capital) will partially reflect industry and occupational attachment. And social stratification analysis extends the traditional institutional analysis to account for variation in human capital investment and different rates of return on capital due to differences in race, sex, and social class.

Each thus provides part of the catalogue of variables which enter into the wage determination process. But the real problem is determining how much of the wage distribution is best described by each theory. The few empirical studies which have attempted to test wage models using variables from more than one theoretical framework have produced somewhat ambiguous results.

The most complete of these is Weiss's study of concentration and labor earnings.[68] Before controlling for personal characteristics and other industry variables in his 1966 micro data study, Weiss found annual earnings of male operatives in unregulated industries to be significantly correlated with both "unionization" and concentration.[69] He reported that, "Unionization seems to raise annual earnings by about 16 percent when concentration is low, but to have no effect when CCR (concentration) is high. Concentration seems to raise earnings by about 33 percent when unions are weak, but by only 13 percent when they are strong."[70] After the addition of personal characteristics (residence, race, age, education, family size, and migration) and other industry variables (employment growth, size of establishment, type of manufacturing, percent male employment, percent

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[68]Leonard W. Weiss, "Concentration and Labor Earnings," American Economic Review, March 1966.

[69]Weiss's actual regression result was:

$$Y = 1936 + 53.47 \text{ CCR} + 23.74 \text{ U} - .4426 \text{ U} \cdot \text{CCR}$$
$$(280.5) \quad (7.81) \quad\quad (4.16) \quad\quad (.1030)$$

$$R^2 = .0401$$
$$N = 5187$$
$$\bar{Y} = 4419$$

[70]Ibid., pp. 104-105.

skilled employees, percent employment nonwhite, and percent of

employees residing in the South), the effects of unionization and

concentration decrease significantly. Unionization remains

statistically significant (t = 5.0) but the coefficient falls to the

level where an industry that is 90 percent organized yields earnings

which are only 6-8 percent higher than an industry with only half of

the employees covered by collective bargaining agreements.

Concentration is now only barely significant (t = 2.1) and increased

annual earnings (resulting from a difference in CCR of 40 points--

20 vs. 60) amount to no more than 3 to 5 percent.[71] After the

addition of the personal characteristics data, Weiss can explain about

34 percent of the variance in earnings. He concludes that, "The

effects of most industry characteristics are nonsignificant and often

of unexpected signs after personal characteristics are introduced.

In general, employers who for any reason pay high salaries receive

'superior' labor in the bargain. The general picture is one of fairly

efficiently working labor markets, even where substantial monopoly

may exist."[72]

Weiss's results, however, hardly justify this optimistic con-

clusion. For one thing, Weiss specifies the "unionization" variable

at the industry level rather than at the micro level. Stafford has

shown that the average effect of union membership on relative wages is

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[71]Ibid., p. 108.

[72]Ibid., p. 116.

10-16 percent after controlling for education, age, industry, city

size, region, and race when union membership is measured for the

individual rather than the industry.[73] In addition, Johnson and

Youmans indicate that after controlling for age and education, the

effect of unionism is actually _double_ that found in early institu-

tional studies.[74] In their study union membership increases relative

wage rates by 34.2 percent. One interpretation of this result is that

unionism is a substitute for more education. Unions insulate less

educated workers as well as younger workers from the usual effect of

education and age on wage levels. A correct specification of the

unionization variable might significantly change Weiss's results.

There are other weaknesses in the Weiss study which merit

attention. One weakness lies in his sample of industries. By

restricting his research to individuals employed in mining, con-

struction, manufacturing, transportation, communications, or public

utilities, he fails to account for the full variance in unionization

and concentration in the economy. Including workers in other services

and in wholesale and retail trade would have expanded the variance in

his industry variables and probably would have increased the signifi-

cance of these factors.[75]

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[73]Frank P. Stafford, "Concentration and Labor Earnings: A
Comment," _American Economic Review_, March 1968.

[74]George E. Johnson and Kenwood C. Youmans, "Union Relative Wage
Effects by Age and Education," _Industrial and Labor Relations Review_,
January 1971.

[75]We would expect this result because it is generally known that

Even more important, the specification of the model leaves the results ambiguous. Many of the personal characteristics in the model have little or no relationship to endogenous productivity character-istics and consequently muddy the interpretation that can be given to "fairly efficiently working labor markets." The coefficient of -681.30 on the dummy value for Negro (with t=7.3) indicates a signi-ficant market imperfection due to some form of racial discrimination. The same is true for the dummy value for Spanish surname.

Similarly there are a number of industry variables which are significant and reflect market imperfections rather than differences in the endogenous productivity characteristics in the labor force. The sex composition of the workforce in an industry is significant and in the extreme case of perfect sex segregation might yield a difference in annual earnings of $619. Using a dummy variable for durable manufacturing also makes little intuitive sense as a measure of human capital although the coefficient is significant and accounts for a $211 difference in annual earnings.

If these variables are considered as industry characteristics or "stratification" factors rather than as human capital factors, the degree of misallocation in the labor market is much greater than Weiss estimates. Weiss admits as much in his conclusion.[76]

the service industries and wholesale and retail trade industries are very weakly unionized and relatively competitive at the same time that they are generally low wage. These points should pivot the regression line around giving a higher coefficient (higher slope) on the industry variables.

[76]Weiss, op. cit., p. 115.

This does not necessarily imply that no misallocation
results from high-wage payments in concentrated industries.
Labor "quality" in this study includes such personal
characteristics as race, which may be quite irrelevant to
the objectively evaluated productivity of the laborer involved.
It has been suggested that firms with monopoly power use
part of their profits to hire congenial or socially acceptable
employees, an option not available to employers subject to more
stringent competitive pressures. If so, the earnings of labor
in monopolistic industries may still exceed its marginal-
revenue product, even though they apparently approximate the
value of its alternative product.

In this case the institutional factors explain a large part of the

variance in the personal earnings distribution after controlling for

endogenous productivity characteristics.

Two other recent studies appear to add some collaborative

evidence to this conclusion. In their study of the Chicago labor

market, Rees and Shultz controlled for age, education, experience, and

seniority.[77] They found that among material handlers, the "mean wage

of nonwhites is twenty-nine cents below the mean wage of whites. . . .

The coefficient of the nonwhite dummy in the regression is a negative

thirty-one cents, indicating that only about two cents per hour

can be attributed to differences between nonwhites and whites in the

other characteristics that enter into the regression."[78] The

addition of establishment variables to the Chicago labor market

regressions reduced the effect of the race dummy, but did not eliminate

its significance altogether. Such a result seems to indicate that part

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[77]Albert Rees and George P. Shultz, <u>Workers and Wages in an Urban Labor Market</u> (Chicago: University of Chicago Press, 1970).

[78]<u>Ibid</u>., p. 106.

of the variance in racial wage differentials is due to discrimination

in access to "high-wage" firms. The remaining differential arises

from wage discrimination within each firm.[79]

An even more recent study by Wachtel and Betsey, using multiple

classification analysis on micro data, found a large portion of the

residual variance in wage rates (after controlling for education,

experience, race, sex, age, and marital status) could be explained by

a composite "occupation-industry" variable.[80] Region of employment,

city size, and union status were also significant after controlling

for personal characteristics.

While both of these studies find large wage differentials

related to labor market barriers, neither indicates precisely what

factors operate on the demand and supply sides to produce this result.

Rees and Shultz used dummy variables to account for "industry" while

Wachtel and Betsey relied on dummy variables for occupation-industry

combinations. Neither study addresses the question of what industry

factors--higher profits, concentration, restricted access, etc.--

are responsible for the significant coefficients on "industry."

Beyond the specification problem there is an even greater

weakness in all of these recent attempts to generate wage functions:

none develop an explicit comprehensive wage theory with which to

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[79] For similar results see Alice Kidder, "Interracial Comparisons
of Labor Market Behavior," Ph.D. dissertation, M.I.T., 1967.

[80] Howard M. Wachtel and Charles Betsey, "Employment at Low Wages,"
The Review of Economics and Statistics, May 1972.

interpret the reduced form results. Consequently it is difficult,
if not impossible, to disentangle the particular effects of human
capital variables, other personal characteristics, industry "ability-
to-pay" factors, industry and occupation access barriers, and "pure"
discrimination. To disentangle these factors and explore the
determinants of the personal earnings distribution requires the
development of an explicit model and a set of data which includes
specific variables for human capital factors, industry characteristics,
and stratification effects.

In essence our quest is to distinguish what forms of labor
market segmentation are responsible for the large wage differentials
we find between individual workers in the U.S. economy. Segmentation,
by our definition, is simply the division of the labor force into
"non-competing" groups for any reason: real human capital differences,
unequal access to occupations and industries, and differential wages
for precisely the same job are all bona fide forms. One particular
form of segmentation, however, is singled out for special attention.
This form is "stratification" and refers to segmentation based on
non-human capital factors. It can be said to exist whenever the labor
force is divided on the basis of race, sex, social class, or by insti-
tutional factors such as differential access to union membership.
Stratification, however, takes a number of forms itself, one of which
is "crowding" where workers have differential access to occupations
and industries while another is pure wage discrimination within the
same industry or occupation. Distinguishing between the effects of

"crowding" and "pure discrimination" is often difficult, but an attempt at empirically isolating the two can be made.

In the following chapter, a general model of wage determination is constructed which draws on the strengths of each theory and indicates how the dynamics represented in each theory interact to produce the observed wage structure. In Chapter V a part of this theory is then tested. Attention will focus on the factors which affect the variance in rates of return on given human capital characteristics rather than on the process by which those characteristics are acquired. Thus the analysis will primarily attempt to evaluate the effect of stratification on the personal earnings distribution, given the existing distribution of human capital.

CHAPTER III

A GENERAL THEORY OF PERSONAL EARNINGS DISTRIBUTION

In this chapter a general theory of the personal earnings

distribution is developed. The theory is based on concepts of social

stratification, institutional economics, and human capital (which in

turn embodies the chief tenets of marginal productivity theory).

For purposes of empirical testing, a specific wage function based

on the "crowding" hypothesis is developed and a reduced form is

generated that is consistent with the overall theory. This is done

in order to test the social stratification and institutional elements

while holding constant the human capital factors.

The neoclassical formulation of economic problems normally

assumes: (1) rational individual decision-making, and (2) utility or

profit maximization subject to constraint. Both are inherent in the

marginal productivity theory and form the foundation for the human

capital approach to wage determination.[1] Accordingly, individuals

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[1]In his survey article, Mincer is particularly clear on this
matter. He notes that ". . . an important attraction of this theory
is that it relies fundamentally on maximizing behavior, the basic
assumption of general economic theory." Jacob Mincer, "The
Distrib ution of Labor Incomes: A Survey," Journal of Economic
Literature, March 1970, p. 23. David Gordon has summarized this point
as well.

 "In emphasis if not in precise substantive hypothesis, the
 theories seem to suggest that individuals have a nearly

make two critical decisions which determine their own income. Each

worker decides how much to invest in the accumulation of human capital

stock and how much time to devote to work and how much to leisure.

In the investment decision, individuals are constrained by innate

ability, a diminishing marginal return to increments in investment,

and an inelastic supply of investment funds. In the labor-leisure

choice, the ultimate constraint is the number of hours in the day and

the physiological need for rest. Within a broad range, individuals

determine their own wage rate, the hours of labor they supply, and

consequently their own annual and lifetime earnings.

In the general earnings distribution theory developed here, the

neoclassical assumptions are abandoned. To the extent that the tra-

ditional formulation rests on the concept of free choice or "free

will," the present model embraces the opposite philosophical position;

it is at root socially deterministic. The observed distribution of

earnings is not the product of numerous personal decisions, but rather

primarily a function of social class, race, and sex. Ultimately,

these are the exogenous determinants of wage rates. In a social

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unlimited range of opportunities in the course of their
lifetimes. This implication seems to play the same role in
theories of income as the notion of "consumer sovereignty"
plays in theories of consumption and demand. In consumer
theory, that is, orthodox economists concentrate on the results
of free consumer choice among a given bundle of commodities
with different prices, rather than focusing on the ways in which
institutions tend to define or limit the bundles available for
choice."

David Gordon, Economic Theories of Poverty and Underemployment (National
Bureau of Economic Research, 1971), p. 55.

stratification model of earnings, individual choice or "free will"

is consigned to the error term, as it were, along with other

stochastic variables.

The distribution of earnings is a function of successive

stratification in three markets. In the <u>human capital market</u>, race,

sex, and social class, or what may be called the "social stratifi-

cation" factors, play a predominant role in the distribution of

personal investment opportunities. In the "<u>external</u>" labor market,

race and sex play an essential role in the distribution of individuals

across occupations and industries, human capital held constant.

Finally, in the "<u>internal</u>" labor market, these same social stratifi-

cation factors are responsible for part of the variance in earnings

within specific occupations and industries, again assuming human

capital <u>ceteris paribus</u>.

The General Social Stratification Model

A simplified version of the stratification theory can be

described in a recursive system of functional equations. Race, sex,

and social class are the ultimate exogenous variables which determine

the earnings distribution through a series of primary and supplementary

transformations on human capital, occupation strata, and industry.

(I) $HC_i + F_{HC}(R_i, S_i, C_i, A_i) + \varepsilon_{HC}$

(II) $OS_{ik} = F_{OS}(HC_i, A_i) + f_{OS}(R_i, S_i, C_i) + \varepsilon_{OS}$

(III) $IN_{ij} = F_{IN}(R_i, S_i) + \varepsilon_{IN}$

$$(IV) \quad W_i = F_W(OS_{ik}, IN_{ij}) + f_W(HC_i, A_i) + f'_W(R_i, S_i) + \varepsilon_W$$

where: HC = human capital
      R = race
      S = sex
      C = social class
      A = "innate ability"
    OS = occupation stratum
    IN = industry
      W = wage rate
      i relates to the ith individual
      j relates to the jth industry
      k relates to the kth occupation
      F is a primary function
      f is a secondary function
     f' is a tiertiary function
      ε is a residucal term

Equation (I) indicates the expected maximum quantity of human capital which individual i will be able to acquire.[2] Following Becker, the quantity of human capital demanded is positively correlated with ability.[3] _Ceteris paribus_, those with greater native ability have higher marginal rates of return (_mrr_) on any given level of investment and thus have an incentive to invest more than others.

---

[2] If the present model is used to evaluate the present value of discounted lifetime earnings, HC would refer to the expected lifetime acquisition of human capital. If the model is used to evaluate wage rates at a given point in time, HC is a measure of the individual's human capital at the time when W is measured. To the extent that individuals have different time paths of capital acquisition, the distribution of earnings at a point in time will diverge from the distribution of lifetime earnings.

[3] See Gary Becker, "Human Capital and the Personal Distribution of Income: An Analytical Approach," _W.S. Woytinsky Lecture No. 1_, Institute of Public Administration and Department of Economics, University of Michigan, 1967, p. 5.

The available supply of human capital, however, is restricted by racial, sexual, and class discrimination in the capital funds market while the demand for funds is limited by discrimination in the labor market. In the capital market, minorities find the marginal cost of investment funds (mcf) higher than for others. This affects the quantity of personal human capital accumulated as well as its structure. Entry barriers to apprenticeship programs, for example, are equivalent to prohibitively high mcf rates for specific types of investment.

On the demand side, external and internal labor market discrimination diminish the equilibrium marginal rate of return on investment for minorities by lowering future expected earnings. Together, the lower mrr on investment and the higher marginal cost of funds constrain the amount of human capital acquired by minority members of the labor force. Human capital acquisition, according to the stratification theory, is thus a function of innate ability tightly constrained by the onus of race, sex, and social class origin. As suggested earlier, the error term (ε_{HC}) includes the effect of personal preference and the rational response to wage differentials insofar as the individual is not completely constrained by other variables in the function. This equation is less mechanistic than may at first appear. The effect of race, sex, and social class operates through cultural transference as well as through institutional discrimination. Social class, for instance, obviously plays a significant role in determining human capital investment decisions

by structuring "personal preference." The same can certainly be said for sex and probably for race. Given this perspective, "individual decision-making" is for the most part socially determined leaving only a small residual which can be thought of as pure individual personal preference. The actual "size" of this residual, of course, is open to considerable debate.[4]

The second equation maintains that the probability of individual i entering occupation stratum k is determined primarily by the individual's stock and structure of human capital and native ability. For present purposes, the concept of "occupation stratum" need not be rigorously defined.[5]

Equation (II) can be thought of as the human capital equation in the overall theory. At this stage, the social stratification factors enter the equation independently, but are of secondary importance. Their primary role is played in the first and third equations; that is, minority members of the labor force are assumed to be screened out of certain occupations not so much because of direct occupational entry barriers, but because of the dynamics represented

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[4]For an excellent discussion of how social class, family, and school interact to determine the level of an individual's human capital stock, see Samuel Bowles, "Unequal Education and the Reproduction of the Social Division of Labor," Review of Radical Political Economics, Fall-Winter 1971.

[5]For empirical purposes, an occupation stratum will later be defined as a set of specific census occupations which share similar specific vocational preparation (SVP) and general educational development (GED) requirements as reported by the U.S. Department of Labor, The Dictionary of Occupational Titles (Washington: U.S. Government Printing Office, 1966).

in Equation (I). The stochastic term (ε_{OS}) accounts in part for personal occupation preference after controlling for human capital and the influence of race, sex, and class.

Unlike occupation strata, industry attachment is based on race and sex alone (plus a stochastic factor). This formulation follows from the fact that most industries require a broad range of skills and combine a large number of occupations. For the purpose of the model, the whole spectrum of occupation strata in the economy can be thought of as being replicated in each industry, although the relative number in each occupation stratum varies considerably. The theory maintains that there are racial and sexual barriers which prevent large numbers of minority members from entering certain industries even in occupations which require relatively little human capital or innate ability.

The error term in Equation (III) contains a number of factors beside personal preference. Limits to geographical mobility between labor markets has some effect on constraining "industry choice," given regional differences in industrial structure. Cyclical factors in the aggregate economy also affect the relative availability of positions in different industries. In addition, pure "luck" plays a role in industry attachment; being in the "right" personnel office at the "right" moment may be an important factor in determining an individual's attachment to an industry sector.

Finally in Equation (IV), the personal distribution of earnings is described by the distribution of the labor force into occupation

and industry "slots." Knowledge of an individual's occupation stratum

and industry attachment is sufficient to define the individual's

wage within rather narrow limits. At this point, differences in

human capital and ability as well as differences in race and sex may

still have an independent effect in terms of further defining

individual earnings.

To summarize, stratification plays its primary role in determining

the distribution of human capital. (See Figure 3.1) But it

continues to play an independent and supplementary role at every stage
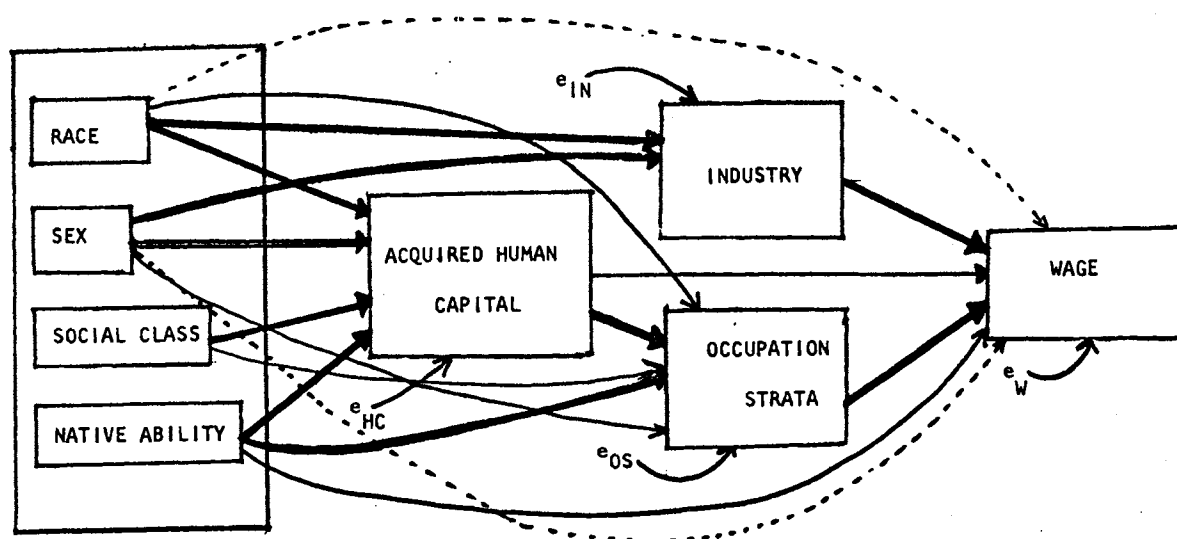
Figure 3.1 A social stratification model of the
personal earnings distribution.

in the wage model. Race, sex, and class affect occupational

attachment independent of their effect on human capital while race

and sex are also key determinants of industry attachment. Finally

these same factors, according to the theory, affect the final

distribution of wages through pure wage discrimination within

specific occupations and specific industries even when human capital

and ability are equal among workers.

Like all general theories, the stratification theory cannot

explain all of the variance in the earnings distribution. The error

term in Equation (IV) must account for a large number of influences

which may have only the most tenuous connection to race, sex, and

social class. To be a complete theory of wage determination, this

framework would have to be expanded in two directions. First, some

attempt would be necessary to explain why stratification and discrimi-

nation play such a crucial role in the earnings distribution, if

empirically they do.[6] And second, some hypothesis would be required

about the demand side of the labor market in order to explain what

appears to be a continuing disequilibrium in terms of industry "ability

_____

[6]Why labor market discrimination persists in light of its
supposed negative effect on efficiency and profits continues to be
one of the critical unanswered questions in modern economics. Whether
discrimination occurs because of employer and employee "tastes" as
in Becker's early analysis, or discrimination is a rational statistical
response to labor market information costs as in Arrow's treatment,
or whether it occurs because of "capitalist attempts to divide and
conquer the labor force" as in some of the radical literature cannot
be directly tested here. What can be tested is how powerful strati-
fication is in terms of the earnings distribution. For background
material on the debate, see Gary Becker, The Economics of Discrimination
(Chicago: University of Chicago Press, 1957); Kenneth Arrow, "Some
Models of Racial Discrimination in the Labor Market," RAND Publication
RM-6253-RC, February 1971; and David M. Gordon, Richard C. Edwards,
and Michael Reich, "Labor Market Segmentation in American Capitalism,"
mimeo, March 1973.

to pay."[7] Neither of these massive efforts is undertaken here.
Rather a more specific earnings generating function is derived which
can test for the size effect of stratification on personal earnings.

The Specific Model

The general model provides a framework for analyzing the total
effect of capital, labor, and product market imperfections on the
distribution of wage income. However, the scope of the present study
is limited to an investigation of only one kind of imperfection.
Here we are concerned with the extent to which barriers to occupational
and industrial access distort the wage distribution among individuals
of equal human capital endowments. For the sake of the present inquiry,
human capital acquisition is considered exogenously determined. Thus
empirical tests will be primarily restricted to Equation (IV). The
specific model is derived from the "crowding" hypothesis first
explicitly formulated by Edgeworth in 1922 and since rejuvenated by
Bergmann.[8]

To begin, assume a world in which there are two industrial (or
occupational) sectors and labor is homogeneous in endogenous

---

[7] One tack taken to understand the differential "ability to pay"
begins with a theory of uneven development within a dual economy.
For more on this subject, see Robert T. Averitt, The Dual Economy (New
York: W.W. Norton, 1968) and Barry Bluestone, "Economic Crises and
the Law of Uneven Development," Politics and Society, Fall 1972.

[8] See F.Y. Edgeworth, "Equal Pay to Men and Women," Economic
Journal, December 1922 and Barbara Bergmann, "The Effect on White
Incomes of Discrimination in Employment," Journal of Political Economy,
March/April 1971.

productivity and inelastic in supply. Furthermore assume that in

the simplest case demand conditions are identical in both sectors

so that the marginal revenue product curves are the same in Sector A

and Sector B. (See Figure 3.2) If there are no barriers to
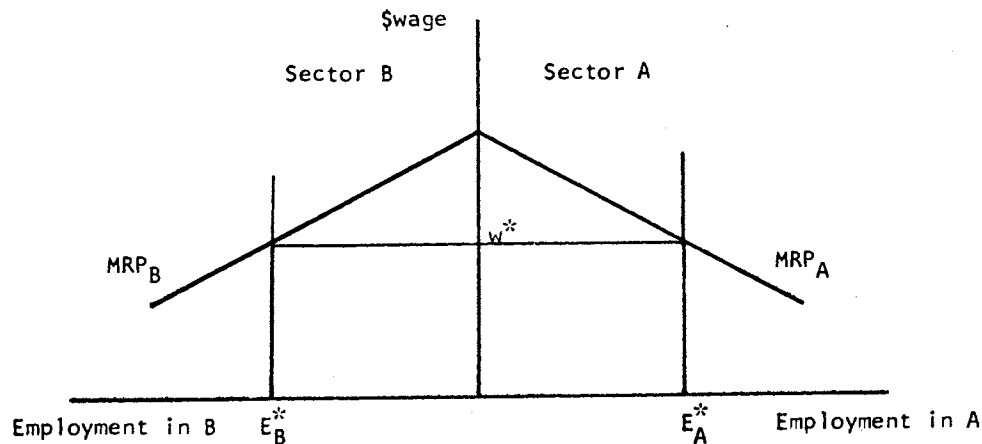
Figure 3.2 No "Crowding"

intersector mobility, in equilibrium an equal number of workers will

be found in both sectors ($E^*_A = E^*_B$) and the universal market wage will

be $w^* = MRP^*$. Each worker is paid his marginal product which reflects

his endogenous productivity. If we relax the assumption of identical

MRP curves, wages will still be equal assuming a perfectly competitive

labor market.

We can now posit that for some reason firms in Sector A refuse

to employ minority workers, restricting their workforces exclusively

to white men. All other workers are forced to find employment in

Sector B. Assuming that labor force participation does not change

after segregation is imposed, the resulting wage and employment

relations will be as described in Figure 3.3.
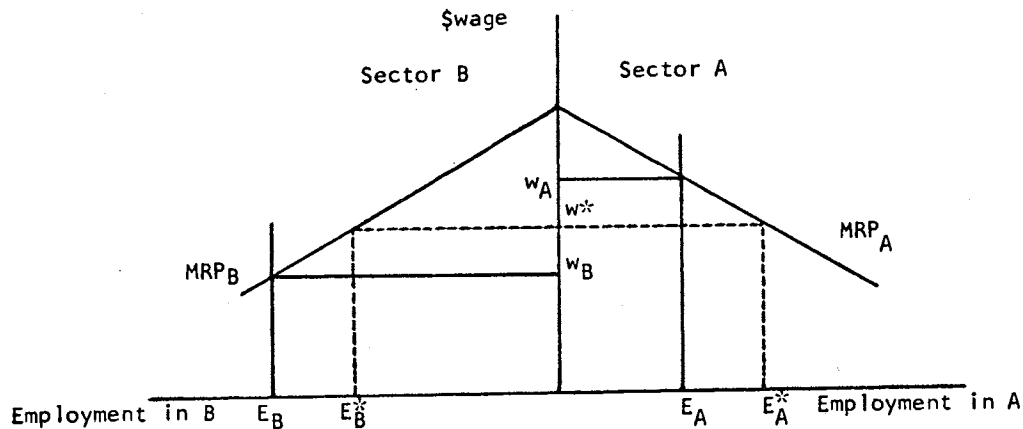
Figure 3.3 Simple "Crowding"

The total labor force $E_A'E_B'$ equals the old level E_AE_B, but the

imposed segregated distribution of workers creates a wage differ-

ential of $(w_A - w_B)$. Each worker continues to be paid the marginal

product in his sector $(w_A = MRP_A; w_B = MRP_B)$, but now there is no

correlation between endogenous productivity and relative earnings.

In Sector A, white males are paid a wage greater than their endogenous

productivity would warrant $(w_A > MRP^* = ERP^*)$ while in Sector B, all

minority members are paid a wage below the level that would exist in

a non-segregated economy. In this case we can say that minority

workers are "crowded" into Sector B, resulting in lower earnings.

Imperfect mobility between sectors results in a quasi-equilibrium

where wage differentials can persist and where total output is below

its full equilibrium level.[9]

Once crowding exists, differences in the labor demand schedules

of the two sectors can affect the earnings differential.   In

Figure 3.4, Sector A is drawn so that the marginal revenue product
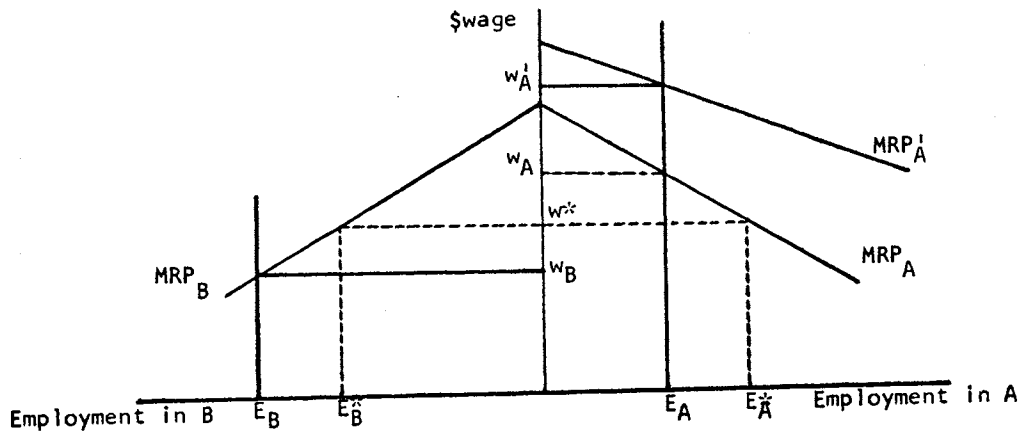
Figure 3.4   Complex "Crowding"

of labor is higher than in Sector B for every equal level of employ-

ment. $E_A E_B$ continues to represent the total supply of labor

$(=E_A^* E_B^*)$, while minorities are limited to employment in Sector B.

Under these conditions, the wage differential will be larger.   Either

because of higher marginal physical product (MPP) or higher marginal

revenue (MR) or both, workers who have access to Sector A will benefit.

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[9]Obviously this result requires imperfection in the _product_ market
as well. If all product markets were perfectly competitive, any
employer who paid a wage higher than MRP* to attract a full complement
of white male labor would shortly be forced out of the market. At a
minimum this model requires some imperfection between _economic_ sectors.

If for some reason minority workers were restricted to the sector
with a higher marginal product, it is possible that demand conditions
could offset the observed effect of simple crowding. We expect that
in most cases, however, minorities will be crowded into those sectors
where demand conditions are relatively weak, thus adversely affecting
their relative wage position. Over time there is a tendency for
simple crowding to become "complex." Industries in sector A will tend
to substitute capital for labor because wages are high, while
industries in B will substitute labor for capital. The present situ-
ation in U.S. labor markets may reflect this long-run effect.

There is no problem in generalizing this model to n sectors.
Assuming homogeneous human capital, imperfections in the product
market, and the existence of crowding, the complete earnings distri-
bution would be described by the set of quasi-equilibrium wage rates
established in each sector. Nor is there a need to specify perfect
segregation by race, sex, or some other non-endogenous productivity
factor for the crowding model to be perfectly serviceable. One of
the key hypotheses to be tested, in fact, is that the distribution of
earnings is a function of the degree of crowding in each occupation
and industry. Ceteris paribus, the smaller the proportion of
minorities employed in an occupation or industry, the higher the wage.

A Mathematical Treatment

The crowding hypothesis can also be described mathematically.
In doing so the parameters that determine wages in the presence of
market segmentation can be derived. Assume once again that human

capital is homogeneous in a two sector labor market. Furthermore assume that the marginal productivity of labor is a linear function of the number of workers in each sector and is independent of the number of workers employed in the other sector. Finally, assume that employers are unwilling to pay a wage to each worker that exceeds marginal productivity and that workers in a given sector refuse employment which fails to pay them their marginal product. This assures that sectoral wage rates will never be above nor below the marginal revenue product in each respective sector. These last assumptions are only included to simplify the exposition.

The model can be expressed in two linear labor demand equations:

(1) $w_A = a_A - b_A E_A$

(2) $w_B = a_B - b_B E_B$

where $b = dw/dE$

and one employment constraint:

(3) $E_T = E_A + E_B$.

By making alternative assumptions about the intercept term in sector, a_i, the relative slopes of the MRP curves, b_i, and the number of workers employed in each sector, E_i (determined exogenously), measures of the wage differential between the two sectors ($\delta = w_A - w_B$) can be derived.

Four different cases of crowding can be isolated.

(I) <u>No Crowding</u> (with identical demand curves)

   Assume $a_A = a_B$

   $b_A = b_B$

   E_T is mobile between sectors

In this case there are no barriers to intersectoral mobility. Any wage differential between the two sectors will induce some workers to move from the lower wage sector to the higher wage sector until wage rates are equalized throughout the whole economy. In this instance, because the demand curves are identical, employment will be divided equally between the two sectors in equilibrium ($E_A = E_B$) and

$$(4) \quad \delta = w_A - w_B = (a_A - b_A E_A) - (a_B - b_B E_B) = 0$$

(II) <u>Simple Crowding</u>

   Assume $a_A = a_B$

   $b_A = b_B$

   $E_B > E_A$

Here the MRP curves are identical, but minority workers are excluded from Sector A. Therefore,

$$(5) \quad \delta = (a_A - b_A E_A) - (a_B - b_B E_B)$$

$$= b(E_B - E_A)$$

$$= \frac{dw}{dE} (E_B - E_A)$$

In this case the total wage differential is a function of the number of workers confined to each sector. The greater the slope of the identical demand curves, the larger the wage differential given E_A and E_B.

(III) "Complex Crowding" - Type 1

Assume $a_A > a_B$

$$b_A = b_B$$

$$E_B > E_A$$

In this case minorities are crowded into Sector B and the demand curve in Sector A is above the schedule in Sector B. At every level of equal employment in both sectors, the marginal revenue product in A is greater than in B. The wage differential, δ, will then reflect both the "supply" effect of segregation and the "demand" effect of the vertically shifted MRP curve.

$$(6) \quad \delta = (a_A - a_B) + b(E_B - E_A)$$

$$= (a_A - a_B) + \left[\frac{dw}{dE} (E_B - E_A)\right]$$

In the linear model, the two effects are simply additive although the existence of segregation is a necessary condition for the existence of any "demand" effect.

(IV) "Complex Crowding" - Type 2

Assume $a_B > a_B$

$b_B > b_A$

$E_B > E_A$

In this more general case, the demand curves have different slopes as well as different intercepts. Here MRP_B has a lower intercept and is more inelastic than MRP_A at every level of equal employment in the two sectors.

$$(7) \quad \delta = (a_A - a_B) + (b_B E_B - b_A E_A)$$

$$= (a_A - a_B) + \left[\left(\frac{dw}{dE} \right)_B E_B - \left(\frac{dw}{dE} \right)_A E_A \right]$$

This last equation can be expressed in terms of demand elasticities by substituting $(w_i/E_i)/\eta_i$ for the b_i in each equation. Therefore,

$$(8) \quad \delta = (a_A - a_B) + \left[\left(\frac{w_B}{E_B} \right) \cdot \left(\frac{1}{\eta_B} \right) E_B \right] - \left[\left(\frac{w_A}{E_A} \right) \cdot \left(\frac{1}{\eta_A} \right) E_A \right]$$

Rearranging the terms in equation (8) yields:

$$(8') \quad w_A \left(1 + \frac{1}{\eta_A} \right) - w_B \left(1 + \frac{1}{\eta_B} \right) = (a_A - a_B).$$

$$(8'') \quad \frac{w_A}{w_B} = \frac{(a_A - a_B)}{w_B(1 + 1/\eta_A)} - \frac{(1 + 1/\eta_B)}{(1 + 1/\eta_A)}$$

Finally, letting w_B be the numeraire ($w_B = 1$), we can derive an expression for the _relative_ wage, w_A'.

$$(9) \quad w_A' = \frac{1 + a_A - a_B + 1/\eta_B}{1 + 1/\eta_A}$$

Thus with employment levels set exogenously, relative wages will be a function of the loci of the respective sectoral demand curves. More specifically, if the intercepts are equal ($a_A = a_B$), expression (8'') reduces to:

$$(10) \quad \frac{w_A}{w_B} = \frac{(1 + 1/\eta_B)}{(1 + 1/\eta_A)}$$

and it is clear that, given intersectoral immobility, relative wages are a function of relative employment levels and the labor demand elasticities in each sector.

One interesting implication of the "complex crowding" model is that in the face of intersectoral immobility, the earnings of minorities may still be equal to or even exceed those of the dominant employment group if the labor demand schedule in the crowded sector is sufficiently above that in the discriminating sector. From equation (7) it is clear that given equal intercepts, the wage

differential is reduced to zero when the ratio of the demand slopes is inversely proportional to the ratio of employment in the two sectors. That is, $\delta=0$ when $b_B/b_A = E_A/E_B$ and $a_A = a_B$. More generally, when the intercepts are not equal, $\delta=0$ when:

$$(11) \qquad \eta_B = \frac{1}{1/\eta_A + a_B - a_A}$$

This follows from equation (9).

While this may be only of theoretical interest, it implies that if for some reason crowding could not be overcome, wage equalization could still be brought about by manipulation of the derived demand for labor in each sector of the economy. That is, if somehow the demand curve in the crowded sector can be raised above the demand schedule in the discriminating sector, the wage differential can be reduced. Increased demand in the crowded sector can thus compensate for the earnings effect of "oversupply."

The Reduced Form

To measure the composite effect of "crowding" and differentiated labor demand conditions, it is necessary to hold endogenous productivity characteristics constant and investigate the remaining variance in the earnings distribution. This is equivalent to standardizing for human capital and then carefully measuring the composition of the remaining wage differential, δ.

Assuming that endogenous productivity is measured perfectly, a non-zero differential indicates either some degree of crowding or an inequality between wage rates and marginal revenue products, or in all probability, some combination of the two. The portion of the differential due to the relative positions of the employment suppy curves, E_A and E_B, and the MRP schedules can be identified as resulting from industry or occupational crowding. Any remaining differential must then be due to either imperfections in labor market information or to pure wage discrimination _within_ industries and occupations (assuming no measurement or specification error in the human capital and "crowding" variables).

Obviously this course of empirical investigation is fraught with obstacles. Controlling totally for endogenous productivity is an impossibly difficult task. There are a myriad of individual characteristics which enter into the composition of an individual's endogenous productivity. Measuring even a small number of these, independent of the price they exact in the market, requires careful specification. Even then it is difficult to know how much of the remaining variance may be due to unmeasured endogenous productivity traits.[10]

---

[10]Is physical height, for instance, an important "endogenous productivity characteristics" for salesmen? If it is and this particular variable is not included in the earnings generating function, we will obviously fail to account for all the variance in salesmen's salaries. Worse yet we may erroneously attribute some of the variance in earnings to another variable which is covariant with height. In this case we run the risk of fostering a mistaken conception about the arguments in the earnings function.

A no less difficult problem arises in identifying the labor

supply and demand schedules for each sector of the economy. Measuring

the elasticity of demand for labor in a particular industry, let alone

in all sectors of the economy, poses some severe methodological

problems. The same can be said for measuring the sectoral labor supply

curves, even accepting the simplifying assumption of zero elasticity.

Finding useful proxies for identifying the loci of the individual

supply and demand curves consequently requires some ingenuity.

Still another problem arises in specifying the functional form

of the final model. In anything so complex as wage determination,

many factors will enter interactively rather than independently.

However the relatively simple substitution of log space for even

simpler linear space may add very little power to an earnings

generating function; the actual interactions between variables may be

much more complex than log linear.[11]

---

[11]The size distribution of personal income in most Western
capitalist nations appears to be lognormal leptokurtic with a Pareto
upper tail. Consequently, in order to explain how this distribution
occurred, many investigators have attempted to replicate this form
through variations in a lognormal function of human capital factors.
This research has had mixed results. See, for instance, Lester C.
Thurow, Poverty and Discrimination, op. cit. In this work, Thurow
fits an equation of the following form:

$$I_{ik} = AEd_i^b Ex_k^c$$

where I_{ik} = income for an individual with i years of education and k
years of experience; A = shift coefficient; ED_i = i years of
education; Ex_k = k years of experience; and b and c are income
elasticities. He concludes that education interacting with years of
work experience is an important ingredient in explaining the

For all practical purposes, it is impossible to deal definitively with these problems in an empirical analysis. It is possible, however, to specify some of the most obviously important human capital variables and then, using a number of carefully constructed industry and occupation indices, investigate the extent to which the remaining variance in earnings can be explained by market imperfections. Two stage equations might be used for such an analysis, assuming that an individual's endowment of native ability and his acquisition of human capital temporally precede his entry into a specific occupation and industry. In this case the first equation would specify individual earnings as some function of endogenous productivity characteristics plus a residual term, ε_1. The second equation would attempt to explain ε_1 in terms of industry and occupation variables acting as proxies for measures of labor supply and demand.

Following this procedure and assuming careful measurement of all variables, there would be strong evidence in support of the "pure" human capital theory if the first equation accounted for a large part of the variance in earnings while the second equation failed to explain much of the variation in ε_1. Conversely, if a large portion of the variance in earnings was explained by equation two, this would constitute evidence of significant labor market imperfections. The substance

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distribution of earnings. For a more general theory of complementarities among independent variables in income generating functions, see Martin Bronfenbrenner, Income Distribution Theory (Chicago: Aldine-Atherton, 1971), pp. 50-54.

of these imperfections could only be known if one were to have some

confidence in the proxy variables for segregation. If these variables

truly measure "oversupply" or differential demand, then significant

coefficients in the second equation are a strong indication of

"crowding" and the residual in this equation, ε_2, measures, at least

in part, the earnings effect of imperfections in labor market informa-

tion and/or "pure" wage discrimination. Thus in a well-specified

system of equations it would be possible to measure (1) the effect of

differential endogenous productivity on the distribution of earnings;

(2) the effect of industry and occupation crowding on wage differ-

entials between individuals; and (3) the residual effect of information

imperfections and pure wage discrimination.

No matter the propriety of a two stage analysis for testing the

stratification theory, a single equation reduced form has been used

in the present research. The regression equations take the familiar

form:

$$w_i = \alpha_i + \sum_i \hat{\beta}_i X_i + \varepsilon$$

The use of this equation is warranted by the relative intractability

of more complex equation systems and by the prohibitive cost involved

in actually fitting large amounts of micro data in multiple stages.

This procedure is not unusual in that virtually all previous attempts

at measuring the determinants of earnings through large micro samples

have also relied on single regression equations.[12,13] For the same

reasons of tractability and cost, the basic equation is fundamentally

additive.[14]

The right side of the equation is composed of four groups or

"modules" of X_i variables. One controls for human capital; another

controls for non-monetary effects on relative wages due to working

conditions; and the last two are proxies for the loci of the labor

supply and demand schedules. The actual regression equations take the

linear form:

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[12]See, for instance, Morgan, et al., Income and Welfare in the
United States, op. cit.; Weiss, "Concentration and Labor Earnings,"
op. cit.; Rees and Shultz, Workers and Wages in an Urban Labor Market,
op. cit.; Stafford, "Concentration and Labor Earings: A Comment," op.
cit.; Johnson and Youmans, "Union Relative Wage Effects by Age and
Education," op. cit.; Bennett Harrison, Education, Training, and the
Urban Ghetto (Baltimore: John Hopkins Press, 1972); and Wachtel and
Betsey, "Employment at Low Wages," op. cit.

[13]Actually, as explained later in the text, a decision rule was
followed in fitting the equations such that an approximation to a
sequential equations model is obtained. In effect, the human capital
variables are held constant (or nearly so) when the industry and
occupation variables are added. This is analogous to allowing these
latter variables to explain only the residual variance in the earnings
function.

[14]In running the regressions, several log linear forms were
tried on several sets of data. In each case, the log transform
equations did not perform appreciably better than the simpler linear
equations, and in a few cases they performed a bit worse. For this
reason, and also because the additive model was much easier to inter-
pret and evaluate, the final regressions were run in the additive
rather than interactive form. In future research I hope to experiment
with several different transformations on the raw data. These may yield
somewhat better results if a transform can be found which more approxi-
mates the actual underlying interactions between independent variables
and the true relation between independent and dependent variables.

$$w_{ijrs} = a + \sum_k b_{jkrs} HC_{ijkrs} + \sum_m b_{jmrs} IND_{ijmrs}$$

$$+ \sum_n b_{jnrs} STRAT_{ijnrs} + \sum_p b_{jprs} WC_{ijprs} + \varepsilon$$

where w_{ijrs} = wage rate for individual i of race r and sex s in occupation stratum j

HC_{ijkrs} = human capital characteristic k for individual i

IND_{ijmrs} = industry characteristic m associated with the industry within which individual i is employed

$STRAT_{ijnrs}$ = a measure n of industry or occupation "crowding" for the industry or occupation within which individual i is employed

WC_{ijprs} = a measure p of working conditions in the specific occupation within which individual i is employed.

ε = an error term

The ability to accurately estimate this set of equations depends on the existence of a suitably large comprehensive micro data set and an adequate specification of each module.

The Data Source and the Set of
Regression Variables[15]

The basic data for this study is taken from the 1967 Survey of

Economic Opportunity compiled by the Office of Economic Opportunity and

the Bureau of the Census.[16] A total of some 61,000 individuals are

found in the SEO file, approximately half of which are contained in a

self-weighting sample of the United States population. The other half

of the sample is drawn from individuals living in predominantly

nonwhite census tracts. This oversample provides much better estimates

of nonwhite population parameters and consequently it is used along

with the blacks in the self-weighting sample to estimate the black male

and black female equations.[17,18]

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[15]For an extended description of the data base and how it was
compiled see Appendix A.

[16]The Survey of Economic Opportunity is available from the SEO
Clearinghouse, Data and Compilation Center, Social Science Building,
University of Wisconsin, Madison, Wisconsin 53706. More information
about the SEO can be obtained from the Clearinghouse including codebook
and user's guide.

[17]Comparisons of the means and standard deviations from the
nonwhite segment in the self-weighting sample and the nonwhites in the
special oversample indicated no significant differences in terms of
all of the variables used in this study. However, there were signi-
ficant differences between the whites in the self-weighting sample
and the whites included in the oversample. For this reason, the
oversample population was added only to the black equations. The
N's were already of sufficient size in the white equations and the
addition of this special sample to the black equations allowed
extensive stratification of the black population without loss of
statistical significance. The oversample is not used in the race-sex
pooled regressions.

[18]Unfortunately, it was necessary to delete nonblack nonwhites
from the sample population. The SEO does not contain large enough

From the SEO file, all _full-time, full-year_ workers were selected.[19] This subsample was further refined by the elimination of all those who either did not report a wage rate or reported that their present job was not their "usual job." In addition all workers below age 25 were excluded leaving a sample of predominantly prime age individuals. The total N in the final sample is 13,896.

Data on specific occupation, specific industry, race, sex, hourly wage rate, years of schooling completed, region at age 16, migration from place of residence at age 16, and union membership status were obtained for each individual from the 1967 survey. In addition data on vocational training were available for nearly three-fourths of the sample from the 1966 SEO panel. Where the 1966 and 1967 SEO individuals matched, their training data was merged onto the 1967 tape.

Industry and occupation characteristics available from a number of macro data sources were then merged onto each individual record in the sample. Thus each final record contained not only data on an

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samples of other minorities to permit statistical analysis. At the same time, other minorities have sufficiently different labor market experiences that to include them with blacks would bias the empirical results. For information on different labor market experiences of minority groups, see Larry Sawyers, "The Labor Force Participation of the Urban Poor," Ph.D. dissertation, University of Michigan, 1969.

[19]Full-time, full-year represents all those who (1) reported 30 or more hours of work in the week preceding the interview and (2) reported 40 or more weeks of employment in 1966. This definition is somewhat more lenient than the normal Labor Department definition. It was used in order to take into account those who have normal full-time jobs with some degree of seasonality and those who have full-year jobs where a full work week is somewhat less than a full forty hours, · a situation which is becoming more prevalent.

individual's schooling, for instance, but also on such factors as

the profit rate and the concentration ratio in the specific three-

digit SIC industry in which the individual worked in 1967.

After merging the macro and micro data, the total sample was

stratified into occupation groups. Each of the 298 census occupations

was matched to the Dictionary of Occupational Titles yielding

unweighted average General Educational Development (GED) and average

Specific Vocational Preparation (SVP) scores for each occupation.[20]

From these scores, seventeen occupation groups were formed which

were ordinally ranked according to GED and SVP. Next, in order to

create strata with sufficient sample size, groups were added together

to form five broad occupational strata. These are the strata used in

the final analysis. Each stratum contains occupations with the same

narrow GED range and (except for stratum 5) a broader range of SVP

scores. The final occupation strata include groups 1-3, 5, 6-9, 12-14,

and 15-17. Occupation group 4 was too small to be included in the

study. Occupation groups 10 and 11 include "clerical and kindred

workers, nec" and "salesmen and sales clerks, nec." Because of the

heterogeneous nature of these categories it was necessary to eliminate

them from the final analysis.[21]

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[20]For detail on the Dictionary of Occupation Titles and the
construction of the GED and SVP scores, see Appendix A.

[21]Some regressions were estimated for occupation groups 10 and
11. Except for a very weak coefficient on years of schooling completed,
there were no significant results and the coefficients of determination
were always below .05.

In terms of general occupational descriptions, the strata include the following types of workers.

Occupation Stratum	Type of Workers
1-3	Laborers, unskilled workers, menial service personnel
5	Operatives, semi-skilled workers, semi-skilled clerical workers, semi-skilled service personnel
6-9	Skilled operatives, semi-skilled craftsmen
12-14	Mechanics and technicians, skilled craftsmen, skilled service personnel, foremen
15-17	Professionals, high-skilled technicians, managers, officials

This technique of occupational stratification offers a distinct advantage over other methods of categorizing the labor force. Ordinarily, workers are classified into one or two-digit census occupation categories which are differentiated according to job title rather than the presumed requirements of the job. Following this procedure, an operative, for example, is never compared with a given subset of clerical workers or service personnel. Yet for many operatives, the human capital requirements assumed necessary to perform a given job with average proficiency are similar to the requirements established for workers in some clerical or service positions. By dividing the sample on the basis of GED and SVP scores rather than job title, we are able to compare individuals who fill positions having similar educational and vocational requirements but who are employed

in different census-defined occupations. This allows the analysis

of earnings to be carried out for well-defined segments of the

workforce.

The final variable set was chosen from over 180 variables on

human capital, industry, and occupation and represent the closest

proxies which could be found for each of the modules.[22] In many cases

specific variables were chosen in order to make the final results

comparable with previous research.

The dependent variable used throughout the analysis is <u>hourly

earnings</u> which is computed in the SEO from weekly earnings and weekly

hours worked. This variable may be biased by differential overtime

rates, but it is still superior to the usual measures of annual

earnings. In most cases, the hourly wage should refer to the

individual's normal wage because of the "usual" job restriction placed

on the sample. Only in the case of abnormal overtime would a problem

arise.

The independent variables are divided into four modules.

While the modules clearly overlap in some cases, each is an attempt

to measure an identifiable force in the earnings generating function.

<u>HUMAN CAPITAL MODULE</u> The seven factors in the human capital module

are used to measure the effect of acquired endogenous productivity on

individual earnings. In addition, by including these variables in the

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[22] See Appendix A for a discussion of how the data were developed
and a detailed description of each variable.

regression equation, we can hold them constant and investigate the
effect of other variables consistent with the stratification
hypothesis.

The seven human capital variables include the following:

Schooling - Formal education is measured by the commonly used
variable, years of school completed. This is a continuous variable
with the normal expectation of a positive correlation between it and
the dependent variable. In the linear additive mode, β can be
interpreted as the mean marginal hourly earnings expected from an
additional year of schooling.

School-South - To control for the effect of school quality on
earnings, an interaction term is used. The school-south variable
equals the years of schooling completed multiplied by a dummy variable
(=1) if living in the south at age 16. It is expected to be negative.
The sum of the $\hat{\beta}$s for the schooling and school-south variables yields
the additional earnings from a year of schooling controlled for
region. Clearly this is not an optimal quality control measure for
a number of reasons, but better measures were not available.[23]

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[23] The inherent problem with the school-south variable is that
it may measure the effect of "region" per se rather than the effect
of school quality. This is particularly true if there is little
interregional migration after age 16. In this case, if the effect of
"region" operates through factors unrelated to human capital, the
final equation will overestimate the impact of endogenous productivity
on earnings. This will, of course, favor the human capital explanation
of earnings rather than the stratification hypothesis. Ceteris paribus,
the bias in this variable is in favor of the null hypothesis that the
industry and stratification variables have no effect on earnings.

Geographical information on state or SMSA, which would have been

useful for merging educational resource data onto individual records,

was deleted by the Census Bureau from the SEO user tape for reputed

reasons of confidentiality.

Training - Current or previous enrollment in an institutional

manpower training program is measured by a dummy variable.[24] This

variable is intended to measure specific vocational training beyond

regular schooling. According to human capital theory, its coefficient

should be positive representing a financial return to general training.

The coefficient would be zero only if the training was financially

provided by the current employer at no expense to the worker.[25]

Migration - Geographical mobility is also measured by a dummy

variable which takes on the value of 1 if an individual has not changed

residence by more than 50 miles since age 16. Migration is considered

an investment in human capital insofar as it raises the marginal

product of the migrant.[26] Migration, in this sense, is analogous to

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[24]Vocational training covered by this variable includes:
(1) business college or technical training (2) apprenticeship training
(3) full-time company training (4) vocational training in the armed
forces (5) other formal vocational training and (6) non-regular general
schooling.

[25]For a discussion of the theory behind specific and general
training, see Jacob Mincer, "On the Job Training: Costs, Returns, and
Some Implications," Journal of Political Economy, Part 2, Supplement:
October 1962; and Gary Becker, Human Capital, op. cit. esp. Chapter 2.

[26]For an excellent discussion of the human capital theory of
migration, see Samuel Bowles, "Migration as Investment: Empirical Tests
of the Human Investment Approach to Geographical Mobility," Review of
Economics and Statistics, November 1970.

investment in schooling or training. Given rational mobility, we expect a negative coefficient on this variable. To the extent that migration is undertaken for non-monetary reasons or is involuntary, it is possible that the coefficient will not be significantly different from zero for some groups.[27]

Experience - No direct measure of labor force experience is available in the SEO. As a substitute, a variable which measures experience as a simple function of age and formal education was created.[28] This assumes that once individuals leave school, they immediately join the workforce and work continuously thereafter. Because of the large variance in the pattern of female labor force participation, this is not a particularly good measure of work experience for women, yet it may be an adequate proxy for men.

Experience, according to human capital theory, is an important factor for it is a form of directly usable specific on-the-job training. The experienced salesman, for example, is more productive because he not only knows his product, but learns through experience the personal quirks of his customers. To account for this effect, a number of

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[27] If working married women move in response to the employment opportunities of their husbands, migration may not have a salutary effect on their earnings. Thus the coefficient may very well be zero for women. This may be complicated by a racial effect for historically northern migration by blacks has been beneficial, no matter the reasons for mobility. Thus while white women may not benefit from migration, black women (and all men) might.

[28] The variable was created by making "experience" = age - years of schooling completed - 5. This is similar to the construction followed by Thurow and others in creating an "experience" variable for the analysis of earnings functions.

previous wage studies have used proxies for experience. Most have

found a strong positive correlation between the proxy and earnings.[29]

However, the use of "experience" as a human capital variable

is questionable. Because of the ambiguous nature of the "experience"

variable, little can be said about the meaning of a significant

positive coefficient on this factor.[30] Nevertheless we have included

the variable in the final regressions and we will normally interpret

it as though its main effect is to augment endogenous productivity.

This, of course, biases upward the total explanatory power of "human

capital" in the earnings generating function. If we were to take the

alternative interpretation of the experience variable--that experience

or seniority reflects nothing more than institutionalized pay incre-

ments based on length of service and set out in collective bargaining

agreements or offered by employers to maintain morale--it would rightly

be considered as one of the industry factors.

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[29]Thurow has used years in the labor force as a proxy for
"experience" or on-the-job training and concludes that a large portion
of the difference between white and Negro incomes can be explained by
differences in the returns to experience. See, Lester Thurow, "The
Occupational Distribution and Returns to Education and Experience for
Whites and Negroes," Federal Programs for the Development of Human
Resources, Joint Economic Committee (Washington, D.C. 1968), pp. 267-84.
Rees and Shultz use "seniority" as a measure of work experience and
find it to be the most significant variable in explaining the wages
of workers in their Chicago labor market study. See Rees and Shultz,
op. cit. In other studies, the variable "age" is often used as another
proxy for work experience.

[30]The ambiguous nature of this variable was discussed in the
section on "Empirical Studies of the Human Capital Earnings Function"
in Chapter 2.

<u>Specific Vocational Preparation</u> (SVP) - The final human capital variable measures the amount of on-the-job training time required to gain average proficiency in an individual's census occupation. The actual variable is continuous taking the values of 1.0 through 9.0 reflecting actual training time in months and years. (See Appendix A) It is used directly as a measure of investment in on-the-job training and supplements the measure of institutional training.

Like the "experience" variable, SVP also has an ambiguous meaning. It differs from such variables as schooling, migration, and institutional training in that it does not occur temporally previous to employment in an industry or an occupation. An individual must gain access to a specific job <u>before</u> SVP is acquired. Thus if individuals are barred from entering occupations which require long training periods, the training may in fact contribute to their marginal product, but it should not be considered an unambiguous "human capital" factor. If stratification exists, SVP can be considered an occupation trait such as union affiliation in a union or closed shop.

Unfortunately there is no independent measure of "native ability" in the SEO and consequently the final equations are less than completely specified according to theory. To the extent that native ability is positively correlated with acquired human capital, at least within race and sex groups, the absense of this factor has the effect of biasing upward the coefficients on the specified variables in the module. The purely independent effect of native ability must then be assigned to the error term. A critical problem arises, however, if

innate ability is significantly correlated with industry or occu-
pational attachment independent of human capital acquisition. In this
case some of the variance assigned to industry and occupational
stratification in the regression may in fact be due to differences in
ability. While there is no concrete evidence on which to decide this
point, it seems reasonable that innate ability probably has some
independent effect on earnings within an industry or occupation, but
little effect on determining initial employment attachment. The
information costs to the employer of acquiring independent measures of
the native ability of prospective employees probably precludes the use
of such a measure in initial hiring decisions. If this is true, the
effect of native ability on earnings will appear in the error term;
it will not significantly bias the coefficients on the industry and
stratification variables.

STRATIFICATION MODULE For measures of "crowding" or segregation, we
rely on factors which affect the relative labor supply locus for each
industry and occupation. In the stratification theory, these variables
are related to race, sex, and social class. In the traditional
institutional theory, relative supply schedules are determined through
trade unionism and sometimes by other means (e.g. civil service channels).

For present purposes, measures of relative crowding by race,
sex, and union membership status are used. Labor market stratification
occurs along other dimensions as well. However measures of social
class stratification are not available and we can only speculate about

other non-human capital characteristics used to segment the labor force.

Although it is tempting to equate stratification with labor market discrimination, the hypothesis under examination does not rely on this interpretation. Stratification may occur through a socialization process and be related, at least in part, to cultural institutions and tradition. Women, for instance, may tend to stratify themselves into certain types of "women's work." Whether this form of stratification is "voluntary" or not depends on a whole set of subtle psychological and anthropological questions which cannot be easily answered.

<u>Union Member</u> - Trade union membership is measured as a dummy variable for each individual in the sample. Union membership can affect earnings in two ways; in both cases the primary effect is through the labor supply schedule. Often in the skilled crafts, labor supply is directly restricted through apprenticeship programs and work rules which are maintained so as to limit the number of workers in a specific occupation. This also appears to occur in a number of professions. Industrial unionism, on the other hand, has the effect of restricting employment in a given industry through its influence in setting the quasi-reservation price of labor.[31] In either case monopoly rents are

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[31] In the case of craft unionism, one can think of the union as affecting the locus of a perfectly inelastic supply curve of labor, moving it leftward on the horizontal employment axis. In the case of industrial unionism, the union affects the locus of a perfectly elastic supply curve, moving it upward on the vertical wage axis. In

created thus making wages positively correlated with union membership, given industry demand schedules and of course assuming that unions are effective in limiting industry employment.[32]

Percent Minority-Industry (% MININD) - Data on minority employment was merged onto the SEO sample from the 1960 U.S. Population Census volume on "Industry Characteristics."[33] The data refer to 105 three-digit industries. The number of white females plus black males and black females was calculated as a percentage of total employment in each industry.

This variable is used as a measure of the relative extent of segregation in each industry. It implicitly assumes that if there were no "crowding" there would be an equal percentage of minority employment in each industry. Industries with relatively few minority employees are considered relatively "uncrowded." The lack of minority representation is assumed to be due to some form of entry barrier which restricts labor supply along racial and sexual lines. The

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setting a "minimum" wage below which no labor will be supplied, the union in effect is setting a reservation price.

[32] In the long run, of course, trade unionism may also affect earnings through the capital-labor ratio. Higher wages in the short run presents an incentive to the employer to increase the capital-intensity of his production process. In doing so, the marginal product of labor is raised, and given labor supply restrictions, this leads to even higher earnings.

[33] U.S. Department of Commerce, United States Census of Population, 1960, "Industry Characteristics," Series PC(2) 7 (Washington, U.S. Government Printing Office, 1966).

percentage of minority employment will then be inversely correlated with earnings, according to theory.

Unfortunately the mere existence of a significant negative coefficient of %MININD, no matter how large, is insufficient to prove the existence of a "crowding" effect. In fact there may not be a definitive proof of crowding at all because of the difficulty in isolating this phenomenon from pure wage discrimination.

Theoretically we can distinguish three cases. Pure discrimination would be the rule if minority workers were paid lower wages in all sectors while percent minority employment (%MININD) was invariant. Alternatively "crowding" would be the best explanation of wage differences if minorities were segregated into some sectors of the economy but both minorities and the dominant group (white men) were paid identical wages whenever both worked in the same sector. Each of these extreme cases is, of course, clear-cut. Unfortunately the case which is more realistic is highly ambiguous as "crowding" and pure wage discrimination probably coexist. It is because of this "colinearity" that the two independent effects cannot be easily identified. The best we can do is to amass as much evidence as possible to draw the distinction knowing full-well that it cannot be proven. The needed evidence can be gathered by carefully specifying the estimating equations. This matter is left to Chapter V.

Percent Minority-Occupation (%MINOCC) - Data on minority occupational representation was merged onto the SEO sample from the 1960 U.S. Population Census volume on "Occupational

Characteristics."[34] The data refer to 298 specific census occupations.

The number of white females plus black males and black females was

calculated as a percentage of total employment in each occupation.

In addition, variables were created for each minority group separately

as well as one for all females.

Analagous to the industry measure, this variable is intended to

gauge the relative intensity of "crowding" in each occupation. Again

it implicitly assumes that if there were no occupational crowding,

each occupation would have an equal percentage of minority workers.

This variable should be inversely related to earnings, but it has the

same problem of interpretation as %MININD.

INDUSTRY MODULE The five variables in the industry module reflect

an industry's "ability to pay" higher wages. "Ability" is related

to the locus of the labor demand curves in each industry and to the

potential size of producer's surplus. In each case, the variables

chosen relate to the traditional factors used in institutional

analyses of wage differentials.

Concentration (Market Power Factor) (MPF) – The measure of con-

centration used in this study is a new one developed specifically

for merging with the SEO data. Similar to the four-firm or eight-firm

concentration ratios normally used as a proxy for measuring oligopoly

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[34]U.S. Department of Commerce, United States Census of
Population, 1960, "Occupational Characteristics," Series PC(2) 7A
(Washington, U.S. Government Printing Office, 1966).

power, the variable used here is a measure of the share of industry

revenues generated by the firms with the largest assets in the

industry.[35] The major difference between this "market power factor"

and normal concentration ratios is that the former has a variant

number of firms in the "largest asset" category. Normally there are

between three and five firms, but the range for the 105 industries

used in the analysis runs from two to eleven. This is necessitated

by the data source used to compute the variable.

This does not appear, however, to present a critical problem,

particularly since the simple correlation between Weiss's concentra-

tion ratios and the MPF's for the manufacturing sector is .89.

Whatever is lost in terms of the specification is more than compensated

by the fact that the new measure can be calculated for the whole

range of industries, not just manufacturing. In this way the full

variance in "concentration" can be taken into account in the empirical

analysis.

As in most previous studies, a positive relationship between

concentration and earnings is expected. This is particularly true

where workers are organized in strong unions. Collective bargaining

power may allow employees to appropriate a share of oligopoly profits

or gain higher wages at the expense of higher consumer prices. Where

unions are weak or nonexistent, concentrated industries may pay higher

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[35]See Appendix A for greater detail on the construction of this
variable.

wages anyway in order to forestall union organizing drives or for

purposes of employee morale. Firms in highly competitive industries

are constrained in their "ability to pay" by market forces.

Union X Concentration - An interaction term is used to improve

the specification of the relationship between unionization (which

is in the stratification module), concentration, and earnings. A

negative sign is expected on the interaction term. Unionization and

concentration each affect the wage rate positively. But for a given

level of unionization, the higher the concentration ratio, the lower

the wage rate. This follows from a theory of bargaining power and

spatial limitations to firm entry. The greater the economic and

political power of management, the easier it is for management to

withstand union wage demands. Conversely, where labor is unified and

firms are relatively weak, but spatial entry barriers provide an

appropriate "ability to pay," one expects higher wages. Where strong

unions are up against powerful corporations, the ability to extract

wage increases may be diminished. The former case is often found in

construction and trucking, the latter often in durable manufacturing.[36]

After-Tax Profit Rate - To measure profitability, an historical

after-tax profit rate (on total assets) was computed for each industry.

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[36]For more on the theory of concentration and unionism, see
Harold M. Levinson, "Unionism, Concentration, and Wage Changes: Toward
a Unified Theory," Industrial and Labor Relations Review, January 1967.
Weiss was the first to use such an interaction term in regression
analysis and found a significant negative sign in some of his equations.
See Leonard Weiss, "Concentration and Labor Earnings," op. cit.

The variable is constructed sc that it measures an average profit
rate for the period 1953-1965. An historical measure is required
for while changes in relative wages may be related to current profits,
it is only logical that wage levels are related to long-run, rather
than short-run, net income.[37]

Capital/Labor Ratio - The capital/labor ratio is measured by
the dollar amount of depreciable assets per production worker in 1965.
It was calculated by carefully merging data from industry tax records
and employment and earnings data. Theoretically, the capital/labor
ratio affects the marginal physical productivity schedule in each
industry through the production function. Assuming the existence of
barriers to labor mobility and wages equal to marginal revenue product
in each sector, the higher the capital/labor ratio, ceteris paribus,
the higher the wage.

Government Demand - Public sector influences on product demand
are measured by the percentage of an industry's output purchased
by all federal, state, and local government agencies. It was computed
from the U.S. Input-Output Matrix for 1958.[38] Given the size of
government expenditures and its skewed distribution by industry, it is

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[37]There is a potential simultaneity problem raised by this vari-
able for wage costs are one of the determinants of net income (i.e.
$\pi = pQ-wL-rK$). To the extent that it exists, however, simultaneity
biases the results in the opposite direction from the positive
coefficient we expect.

[38]Adapted from the United States Input-Output Matrix-1958.
Wassily W. Leontief, "The Structure of the U.S. Economy," Scientific
American, April 1965.

theoretically possible for government to appreciably affect the demand schedule for each industry. In effect, the marginal revenue schedule may be higher in industries affected by government purchases. Theoretically, a shift in government expenditures from industry A to industry B will then affect relative earnings if labor is relatively immobile.

There is, in addition, another explanation for a positive coefficient on the government demand variable. The Walsh-Healy Act and other federal and state legislation provide that government agencies purchase only from firms which pay the "prevailing" wage or higher. In doing this, however, the government sector may be responsible for setting higher wages in those industries where it is a major consumer. This too would explain a positive relationship between government demand and earnings indicating that, ceteris paribus, government-induced employment in the private sector offers higher wages.

WORKING CONDITIONS MODULE Two variables which measure occupational working conditions were added to the final data set in an attempt to control for non-monetary effects on the wage rate. Both variables were calculated from the Dictionary of Occupational Titles. The working conditions scores which were added to the data set represent unweighted averages for the census occupations and were compiled from the specific titles in a manner similar to the calculation of GED and SVP scores. Neither is a particularly powerful measure of working conditions, but represent the best data available at the time of the

original analysis.

Physical Demands - The physical demand variable measures the physical strength required to perform a given specific occupation. The measure categorizes occupations from "Sedentary" (=1) to "Very Heavy" (=5) and is represented linearly. If there is, on average, an aversion to jobs which require heavy physical effort, a positive relationship between this variable and earnings would be expected. In the absence of labor market stratification, workers would have to be compensated with higher earnings in order to perform jobs which require extraordinary physical effort.

Negative Work Traits - The mean number of adverse working conditions in a specific census occupation is the other variable in this module. Adverse working conditions refer to extremes of heat and cold, humidity, noise and vibration, and the existence of physical or mental hazards on the job including fumes, odors, toxic conditions, dust, or poor ventilation. The more adverse the conditions of work, ceteris paribus, the higher the wage necessary to induce workers into the occupation. The specification of this variable, however, may preclude its usefulness for one extremely adverse working condition may require more compensation than several minor ones. Again, the lack of an alternative data source forced reliance on this measure.

OTHER VARIABLES AND DATA The final two variables used in the analysis are dummy measures for race and sex. As we mentioned previously, these variables are used in the cross race-sex equations in order to

distinguish between the effects of "crowding" and other forms of

racial and sexual discrimination in human capital and labor markets.

Care must be taken in interpreting these two variables because of the

difference in the underlying earnings generating functions for each

race-sex group.

The original data set compiled for this analysis of the

stratification theory included virtually hundreds of variables, many

of which were slight variations of the factors included in the final

set. The final variables were selected on the basis of their per-

formance in a large number of <u>macro</u> regression equations. Together

with evidence from previous micro and macro studies of wage

determination, it was possible to arrive at a final set of variables

which reflected all the prime ingredients of an earnings generating

function specified in the general stratification theory. These

variables were then used in the <u>micro</u> regression equations which will

be presented in Chapter V. But first we must deal with the estimation

procedure.

CHAPTER IV

THE ESTIMATION PROCEDURE

Translating the general stratification theory into a particular
reduced form is problematic in itself. Moving the one step further
to fitting actual regression equations poses a number of new diffi-
culties. Before dealing with the empirical results, a brief
discussion of methodology is therefore in order. In this chapter
estimation and testing procedures are developed to circumvent possible
econometric obstacles. One of these concerns the existence of potential
multicollinearity in the exogenous variables. Another is the possi-
bility of specification error.

Potential Multicollinearity

A high degree of multicollinearity is always a potentially
serious ailment in econometric analysis.[1] In the present context it

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[1]Farrar and Glauber show clearly why a high degree of multi-
collinearity poses a serious problem in parameter estimation. In
their words:

"The mathematics, in its brute and tactless way, tells us that
explained variance can be allocated completely arbitrarily
between linearly dependent members of a completely singular set
of variables, and almost arbitrarily between members of an
almost singular set. Alternatively, the large variances on
regression coefficients produced by multicollinear independent
variables indicate, quite properly, the low information content
of observed data, and accordingly, the low quality of resulting

could in fact be fatal. Linear dependence in the set of explanatory

variables would make it impossible to statistically distinguish

between the effect of the human capital variables and the effect of

the industry and stratification factors on the earnings distribution.

In this case we would be reduced to the very unsatisfactory position

of having to resort to pure _a priori_ reasoning in order to distinguish

between the effects of the two kinds of variables. Regressing

earnings on a nonorthogonal set of independent variables would run

the risk of a serious Type I error in which we might reject a true

hypothesis about human capital or at least seriously underestimate

its impact and seriously overestimate the impact of other factors.

For this reason it is incumbent that we test the degree of collinearity

in the data set and use an estimation procedure which minimizes the

possibility of rejecting valid human capital variables which in theory

temporally precede other factors in determining earnings.

Appendix B reproduces the means, standard deviations, and the

zero-order correlation matrices $(X^t X)$ for all of the regressions in

the analysis.[2] Each matrix has been analyzed for pairwise linear

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parameter estimates. It emphasizes one's inability to dis-
tinguish the independent contribution to explained variance of
an explanatory variable that exhibits little or no truly
independent variation."

Donald E. Farrar and Robert R. Glauber, "Multicollinearity in
Regression Analysis: The Problem Revisited," _Review of Economics and
Statistics_, February 1967, p. 93.

[2]We shall use $(X^t X)$ to refer to the zero order correlation
matrix following the notation of Farrar and Glauber. $(X^t X)$ is the

dependence according to a standard rule of thumb. In addition, a
stricter test for collinearity based on a modification of Fisher's
z-transformation was used to check for significant non-zero
correlation between paired independent variables.

As an example of the test results for multicollinearity, we can
look at a portion of the (X^tX) matrix for white males across all
occupation strata. Table 4.1 is representative of virtually all of
the zero-order correlation matrices used in this analysis. It is
clear that this matrix passes the weak collinearity test specified
by Farrar and Glauber.[3] The simple correlations between explanatory
variables never exceed an arbitrary r_{ij} = .8 or .9. This is usually
sufficient to rule out singularity which would be manifest in a near-
zero determinant and the consequent explosion of elements of the
inverse matrix $(X^tX)^{-1}$. But this weak test would certainly not rule
out the possibility of severe arbitrariness in the coefficients of
the explanatory variables or in the size of their standard errors.

The potential impact of multicollinearity on the final
regression results therefore makes an even stronger test desirable.
Modifying Fisher's z-transformation for the confidence interval of an
estimated correlation coefficient fulfills this need. This simple
algorithm tests for substantial non-zero correlation.[4] Each pairwise

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cross product matrix normalized (by sample size and standard deviation)
to unit length.

[3]Ibid., p. 98.

[4]Using Fisher's z-transformation, the confidence interval (z)

TABLE 4.1

ZERO–ORDER CORRELATION MATRIX--WHITE MALES/ALL
OCCUPATION STRATA

	School	School-S	Migration	Experience	SVP	MPF	UNxMPF	Profits	Union	%Min-IND
School	1.000	.069	-.134	-.486	.329	.128	-.145	.082	-.217	-.007
School-S		1.000	-.090	-.074	.032	-.013	-.053	-.061	-.119	.030
Migration			1.000	.063	-.114	-.047	.041	.011	.105	-.037
Experience				1.000	-.121	-.044	.062	.051	.092	.016
SVP					1.000	.116	-.100	.003	-.190	-.026
MPF						1.000	.547	.307	.178	-.157
UNxMPF							1.000	.266	.782	-.162
Profits								1.000	.199	-.133
Union									1.000	-.120
%Min-IND										1.000

$r^*_{ij} = .146$

HUMAN CAPITAL MODULE   INDUSTRY MODULE   STRAT MODULE

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sample correlation coefficient was tested to see if it was signifi-

cantly larger than an arbitrarily low .100 at the lower bound in the

95 percent confidence interval.[5] For the (X^tX) matrix presented in

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around a sample correlation coefficient can be calculated as:

$$z = \frac{z_r - z_\rho}{z_r}$$

where σ_{z_r} can be approximated by

$$\sigma_{z_r} = \frac{1}{\sqrt{N-1}}$$

where z_r is the z-transformation on the sample correlation
coefficient

z_ρ is the z-transformation on the population correlation
coefficient

z_r is the standard deviation of the sample distribution

For the 95 percent confidence interval around the sample r_{ij},

$$z_\rho = z_r \pm (1.96)\, \sigma_{z_r}$$

To modify this formula for use as a test of significant non-zero
correlation, the z-transform for an arbitrarily low correlation, z_ρ^*,
is substituted for z_ρ and Fisher's equation is solved for the lower
bound.

$$z_r^* = z_\rho^* + (1.96)\, \sigma_{z_r}$$

Using Fisher's transformation table and interpolating, the lower
bound r_{ij}^* can be calculated. For a fuller discussion of Fisher's
test, see Edward J. Kane, _Economic Statistics & Econometrics_ (New York:
Harper & Row, 1968), pp. 246-47.

[5]For the purpose of the present analysis, a true population
$\rho_{ij} < .100$ was considered a strong indication of linear independence in

Table 4.1, a sample correlation coefficient, according to this collinearity test, must exceed .146 for the true population coefficient to exceed .100 at the 95 percent level.

Applying this procedure to the correlation matrix in Table 4.1 indicates that while there are a number of instances where a sample coefficient exceeds .146, only two of these involve a correlation between a human capital variable and a variable in another module. In both of these cases, the relationship is curiously <u>inverse</u> suggesting that in the determination of earnings, membership in a trade union may be a substitute for schooling and on-the-job training rather than itself being a function of human capital.[6] Adding the variable for union membership to an equation which already includes schooling and SVP will then not bias human capital coefficients downward.

The same test for collinearity shows some degree of linear dependence among the variables <u>within</u> the stratification and industry modules. Union membership, concentration, and after-tax profits are

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the explanatory variables. While this figure is purely arbitrary, it was purposefully set at a low level to assure a strong test of orthogonality. As it turns out, most of the correlation coefficients in the (X^tX) matrices used in this analysis would pass this orthogonality test even if the ρ^*_{ij} were set at an even lower level. Beside being a strong test, the modification of Fisher's z-transformation allows a consistent test for multicollinearity throughout the whole analysis. An r^*_{ij} was calculated for each (X^tX) matrix based on a ρ^*_{ij} = .100 and the individual pairwise sample correlation coefficients were compared with these values.

[6]This inverse relation is fully consistent with the findings of Johnson and Youmans in their study of the relative effects of unionization, age, and education on earnings. See Johnson and Youmans, <u>op. cit.</u>

positively correlated with each other while percent minority employ-
ment is inversely related to all of these. There is also a degree of
linear dependence in the human capital module. The amount of
collinearity within these modules indicates that it is necessary in
some cases to choose subsets of the human capital, industry, and
stratification factors to avoid the purely arbitrary assignment of
explained variance within modules. In running the actual regressions
this was often done. This pattern of linear independence between the
human capital variables and the industry and stratification factors
and some linear dependence within each module is for the most part
repeated in all of the $(X^t X)$ matrices in the analysis. It assures a
minimum of bias in our estimates of each module but indicates that
caution must be used in interpreting the coefficients on individual
variables.

The Estimation Procedure Mechanics

To be even more certain, however, that the small amount of
inter-module collinearity does not bias the empirical results, a two
step estimation procedure was followed in calculating the regressions.
This procedure assures the integrity of the human capital variables.
The same procedure was followed in each complete regression.

The first step in the regression analysis involved running
earnings equations which only contain the human capital variables.
In each case an attempt was made to find a human capital module which

maximized the explained variance.[7] The second step in the estimation procedure entailed adding stratification module variables into the regression under the strict proviso that the addition of an explanatory variable must not destroy the "integrity" of the best fit human capital equation. If the addition of a given stratification variable made a human capital factor insignificant or statistically reduced its regression coefficient significantly, the STRAT variable was removed from the equation to assure the integrity of the HC module. After the inclusion of any STRAT variables, the industry and working condition factors were added again under the same human capital provision. In this way the assumed causal priority of the human capital variables is not violated by the effect of possible inter-module collinearity. In every case individual variables enter the model in a causal order suggested by the general earnings theory.

The initial test for module "integrity" stipulated that the addition of a STRAT or IND variable must not be allowed to reduce a previously significant HC variable to statistical insignificance at the .05 level. With a few important exceptions, whenever the addition of a STRAT or IND factor wiped out the significance of one or more human capital variables, the newly added factor was eliminated instead. This process was necessary in instances where there was a significant degree of collinearity as measured by the z-transformation test.

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[7] In actuality the "best fit" human capital equation was deemed to be that one which minimized the standard error of the regression estimate (SEE_{min}).

The initial t-test for coefficient integrity assures the statistical significance of the human capital variables, but it is incapable of checking for an absolute change in the size of the coefficients after STRAT and IND variables are added. Thus a second more rigorous test was performed on the human capital coefficients which entailed applying a standard test statistic for the difference between two means.[8]

$$t' = \frac{(\hat{\beta}_1 - \hat{\beta}_2) - (\beta_1 - \beta_2)}{\sqrt{\sigma_1^2 + \sigma_2^2}}$$

Estimates of t' were computed for each human capital variable when there was any doubt about the size of the regression coefficient in the complete equation. With the exception of three special instances which will be discussed in the next chapter, t' was found to be always well below that necessary to substantiate a significant difference in coefficients at the 95 percent confidence level. In most cases $t < 1$ and rarely did it exceed 1.25.

By utilizing the collinearity tests and the two step estimation procedure, the results from the final single regression equations approach those that would be obtained from the use of a two-stage technique. The strict integrity of the human capital module estimates

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[8]From William L. Hays, Statistics for Psychologists (New York: Holt, Rinehart, and Winston, 1963), pp. 314-19.

maintained in this way allows a robust, if not overly-conservative, test of the "crowding" hypothesis.

Problems in Parameter Specification

Controlling for collinearity in the multi-module regression equations assures that the coefficients on the human capital variables are not biased by the addition of industry and stratification factors. But errors in the specification of each variable and the form of the overall equation could result in poor estimates of $\hat{\beta}$. Of particular concern is the specification of the dependent variable and the absence of non-linear terms and complementarities in the exogenous variables.

The Dependent Variable - Becker and Chiswick, as well as others who have studied human capital models, use the natural log of earnings as the dependent variable when investments are measured in time equivalents (e.g. years of schooling, experience, training) rather than dollars.[9] In some empirical research a lower coefficient of determination emerges when earnings rather than the log of earnings is regressed on schooling and experience. Nevertheless, the dependent variable in the present analysis is the simple linear term, hourly earnings. This is consistent with the work of Weiss, Morgan, et al., Hanoch, Rees and Shultz, and Wachtel and Betsey.[10]

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[9]G.S. Becker and B.R. Chiswick, "Education and the Distribution of Earnings," American Economic Review, May 1966.

[10]See Leonard Weiss, "Concentration and Labor Earnings," op. cit.;

Before the final analysis was attempted, a number of preliminary regressions were prepared on individual occupation strata using the natural log of earnings as the dependent variable. In these experiments the log specification did not perform significantly better than a linear specification. Both specifications provided similar coefficients of determination and standard errors of the regression estimate. In a few cases the log equations performed a bit worse than others. For this reason, as well as for ease in evaluating the final results, the non-log specification was retained. While these experiments were not performed on all occupation strata or the cross race-sex equations there does not appear to be any evidence that the dependent variable is less well specified than in comparable studies.

The superiority of the log specification in some research viz-a-viz the adequacy of the normal specification in the present study may be explained by the structure of the respective analyses and the characteristics of the labor force sample in each study. The present analysis is primarily carried out within individual occupation strata rather than across the whole spectrum of occupations in the economy. It is possible therefore that a linear relationship exists between earnings and human capital variables _within_ a specific stratum while the relationship is better represented by a log linear

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Morgan, et al., Income and Welfare in the United States, op. cit.; Giora Hanoch, "An Economic Analysis of Earnings and Schooling," op. cit.; Rees and Shultz, Workers and Wages in an Urban Labor Market, op. cit.; and Wachtel and Betsey, "Employment at Low Wages," op. cit.

form for the economy as a whole. A move from one stratum to the next

in this case would yield a larger than linear increase in earnings

while increased human capital in any given stratum would yield only

a linear increase in wage. The difference in specification efficiency

might also be due to the fact that the present study is restricted

to full-time, full-year prime age workers who are employed at their

"usual" jobs. The relationship between human capital and earnings

may be linear for this group while the log linear relationship found

in some studies may be a function of differential attachment to the

workforce. Differences in education, for instance, may have a larger

impact on wages between a part-time worker and a full-time worker

than between workers who share a similar attachment to the labor force.

Non-linearities in the Exogenous Variables - A number of authors

have used non-linear human capital variables to account for the

concave earnings profile normally associated with experience, age, or

seniority.[11] Normally this is accomplished by running a linear term

and its square additively; evaluation of the first derivative gives

the extreme value of the function while the second derivative assures

that the extreme value is a maximum. Figure 4.1 indicates how such

a function will often appear. If the actual profile looks like AA,

it is obvious that a linear regression estimate can do little better

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[11]For example, Johnson and Youmans use age and age^2 in their
analysis of union relative wage effects by age and education. Johnson
and Youmans, op. cit. Rees and Shultz resort to the natural logarithm
of seniority to better fit this factor in an earnings function.
Rees and Shultz, op. cit.
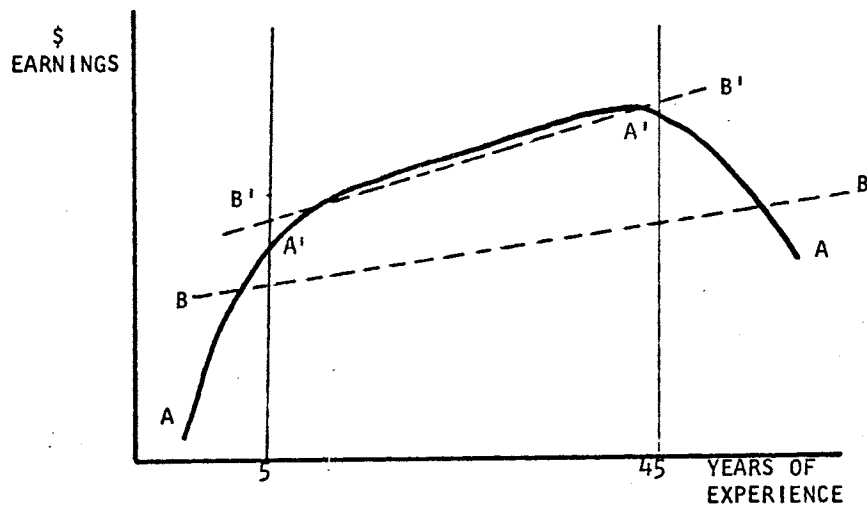
Figure 4.1 The theoretical relationship
between earnings and experience

than BB unless a quadratic form is used. Obviously BB is a very poor

representation of the true relationship between earnings and experience.

Notwithstanding, no quadratic was used in fitting the final

regression equations in the present analysis. Experiments on pre-

liminary equations indicated that the relationship between experience

and earnings was generally linear for the population under study.

This is not inconsistent with the non-linear profiles of previous

research for the present study sample is composed only of those who

are in prime age and working full-time full-year. This excludes those

under age 25 and for all intents and purposes those who are semi-

retired at age 65. Thus we are attempting to fit only the part of

the curve labeled A'A'. The regression line B'B' performs this task

admirably. The addition of a square or logarithmic term would in this

instance fail to explain any more of the variance in earnings.

It is possible that a non-linear term on SVP would have yielded marginally better results given the scaling of this variable. However, if there are significant diminishing returns to longer on-the-job training, as there is for schooling, a non-linear specification may not be superior to the one used in the analysis.[12] In any case, the amount of additional variance that might be explained by using non-linear forms in the human capital module probably does not seriously affect the final results given the sample population. If anything, non-specified non-linearities in the industry and stratification modules may bias the results in favor of the relative strength of the human capital variables viz-a-viz the "crowding" hypothesis.

Complementarities in the Exogenous Variables - A far more serious specification error is conceivably introduced by the absence of interactive relations in the independent variables. The specification used in this analysis implicitly assumes that the effect of each of the explanatory factors is independent of all the others and that their separate effects are strictly additive.[13] For instance, the

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[12]The research of Giora Hanoch is responsible for identifying the diminishing returns to schooling for whites and non-whites in the North and South. See Giora Hanoch, "An Economic Analysis of Earnings and Schooling," op. cit.

[13]The one exception to this generalization is the use of an interaction term to specify the relationship between unionization and concentration.

amount of experience is assumed to have no influence on the returns

to schooling and the returns to increasing both schooling and

experience are assumed to be equal to the sum of the separate returns

to increasing each variable independently.

Among others, Thurow believes that complementarities are con-

siderably important in earnings functions.[14] He has argued that

> Returns are not additive but multiplicative. This may be
> clearly seen in on-the-job experience and education. The
> returns from experience depend partially on the trainee's
> level of formal education. Low education levels make some
> types of training impossible and other types expensive, but
> as the levels rise, training costs fall and the variety of
> training which can be given expands. These complementarities
> also work in the opposite direction. Most jobs require some
> knowledge which is peculiar to the job and is not or cannot
> be acquired in school. Education and experience combined
> yield larger benefits than the sum of the two.

Ignoring complementarities can consequently lead to biased

estimates for factors which enter wage determination in combination

with others. This is particularly true for equations which cover the

whole occupation spectrum. Within a given occupation stratum, however,

we are in effect holding training levels roughly constant while

observing the returns to education. In this case as Thurow has noted,

the regression estimates of returns to schooling and experience are

valid within each training level.[15] Insofar as the primary focus in

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[14]Lester Thurow, Poverty and Discrimination, op. cit., p. 71.
Also Lester Thurow, "The Occupational Distribution of the Returns to
Education and Experience for Whites and Negroes," in Federal Programs
for the Development of Human Resources, A Compendium of Papers
submitted to the Subcommittee on Economic Progress of the U.S. Joint
Economic Committee, 90th. Congress, 2nd. Session (1968) Vol. 1,
pp. 267-84.

[15]Ibid.

the empirical analysis concerns the effect of human capital vs. "crowding" within occupation strata, the absence of interaction terms is somewhat less serious than might otherwise be the case. Complementarities still may play a significant role in the all-occupation equations, possibly leading to an underestimate of the variance explained by the human capital module. We simply have not been able to deal with this problem at this time.

Complementarities may also exist within the industry and stratification modules. However the only interaction explicitly made involves unionization and concentration. A test for additivity between percent minority employment in an industry and minority attachment to an occupation was not made. Consequently these estimates may be biased, but the direction of bias remains a matter of conjecture. An interaction term might turn out to be negative indicating that an individual "crowded" into a minority occupation <u>in a minority dominated industry</u> fares less well than someone in either a minority occupation or industry taken separately. Alternatively the sum of the coefficients on two STRAT variables might tend to overstate the effect of crowding. All we do know is that the zero order correlation between the variables <u>%MININD</u> and <u>%MINOCC</u> is normally of the magnitude .3-.4 indicating a far from perfect correlation between segregation by industry and occupation.

In retrospect the regression results might have been improved by specifying complementarities in the exogenous variables. However such a specification would not be made without cost. Factors such as

experience and SVP (on-the-job training) cannot be interpreted unambiguously as human capital variables (See Chapter II). To tie them more directly to schooling and institutional training would seriously jeopardize the interpretation of the whole human capital module. Furthermore, an extensive amount of expensive experimentation would be necessary before generating the "correct" form of the interaction terms, particularly given the large number of exogenous variables used in this analysis. For these reasons we have relied for the most part on a simple linear model to test our theory. Further research may improve our estimates, but the marginal gain does not seem to warrant the more than marginal cost of obtaining it.

In conclusion we must use a healthy dose of pure common sense in evaluating the final regressions. Nevertheless we can be confident that the problems of multicollinearity and specification error do not seriously impugn the validity of our findings, especially within specific occupation groups. As it turns out the actual regression results tend to be eminently reasonable as will be shown in the next two chapters.

CHAPTER V

THE REGRESSION RESULTS

Having outlined a coherent theory and generated an appropriate
reduced form and a suitable estimation procedure, we are finally in
a position to investigate the empirical results. In this chapter
each of the final regression equations will be separately analyzed.
In the following chapter the regressions will be compared and
evaluated so as to identify what portions of existing wage differ-
entials are due to differences in human capital versus differences
resulting from occupational and industrial stratification.

Recalling Chapter III, the reduced form to be tested is of the
general form:

$$w_{ijrs} = a + \sum_{k} b_{jkrs} HC_{ijkrs} + \sum_{m} b_{jmrs} IND_{ijmrs}$$

$$+ \sum_{n} b_{jnrs} STRAT_{ijnrs} + \sum_{p} b_{jprs} WC_{ijprs} + e$$

where i, k, m, and n refer to the ith individual with the kth human
capital trait in the mth industry with n^{th} degree of crowding and $\underline{j}$
refers to occupation stratum, $\underline{r}$ to race, and $\underline{s}$ to sex. Individual
equations have been run for each race and sex group for each of the

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five broad occupation strata. In addition pooled regressions have

been estimated for each occupation stratum across race and sex groups

and for each race-sex group across all occupation strata. Finally a

"grand pooled" regression was computed for the whole workforce

similar to regressions often found in the literature. Altogether

there are sixty final regressions excluding those where the sample

size is too small to permit statistically significant results.

(I) Stratification by occupation group, race, and sex -

Regressions stratified by j, r, and s are used to generate a series

of distinctive earnings functions for each race-sex group. Each

separate regression is generated on individuals whose particular

occupations share similar educational (GED) and vocational preparation

(SVP) requirements. These equations are especially valuable in

exploring the degree to which wage rates vary within jobs which are

narrowly defined by human capital requirements but potentially differ

in terms of industry characteristics. Accordingly the results can be

used to evaluate the impact on personal earnings of differences in

industrial and occupational attachment within specific labor market

strata. In addition, by stratifying by occupation group it is

possible to ascertain whether specific variables in the model affect

wage rates differentially as one moves up the occupational hierarchy.

More importantly, in running separate equations for each race-

sex group, one can gather some evidence which can be used to isolate

the impact of crowding from the effect of pure wage discrimination.

A significant negative coefficient of %MININD or %MINOCC would be

prima facie evidence of effective "crowding." It would mean, for instance, that black males who gained access to white male dominated industries fared better than their counterparts in crowded sectors. The same would be true for a significant coefficient in the white male equations, the interpretation being that white men who have the misfortune of being "trapped" in minority-impacted industries bear the onus of crowding as well. The absence of a significant coefficient on the STRAT variables in the individual race-sex equations would tend to weigh against the crowding hypothesis. But the case could not be closed on this account alone. Evidence from pooled race-sex equations would not necessarily corroborate this negative finding if the original STRAT variables in the separate race-sex regressions were insignificant only because of a lack of variance in these measures. This, of course, occurs whenever there is perfect or near-perfect labor market segregation (i.e. apartheid).

(II) Stratification by occupation group across race-sex groups - Stratifying by race and sex therefore leads to downward biased estimates of the effect of crowding as the degree of crowding increases beyond some point. In the extreme case all differences in earnings would end up in the constant term or in differences in the coefficients of other regressors and the impact of industry and occupational crowding could not be directly tested. To remedy this potential problem pooled race-sex equations are computed for each occupation group.

Unfortunately this solution tends to do the job too well. If the "crowding" variables are colinear with race and sex--as they obviously are in the case of perfect segregation--then we would now find a potential <u>upward</u> bias in the new coefficients. It is possible, for instance, that earnings differences between race-sex groups are simply the result of "pure" wage discrimination <u>within</u> each industry and occupation. Crowding may then exist, but even in its absence members of minority groups would be paid less.

In the case of perfect segregation it is therefore impossible to determine whether crowding has anything to do with wage determination at all. But where there is incomplete segregation--which is the more usual occurrence--the net impact of crowding can be approximated by running dummy variables for race and sex in the pooled equations. Because of multicollinearity problems mentioned in the last chapter, somewhat arbitrary regression coefficients result, but the final dummied equations at least put a check on the possibility of overestimating the independent effect of industrial and occupational crowding. The true coefficients on the STRAT variables can then be expected to lie between the values given in the pooled regressions with and without the race and sex variables.

(III) <u>Stratification by race and sex across occupation groups</u> - The equations stratified by j are useful for measuring the effect of industry and occupational attachment on differential earnings within narrow GED and SVP ranges. But by their nature these equations will normally underestimate the full impact of human capital on the total

distribution of wage rates across the whole occupation spectrum.
Increases in schooling, training, and migration are usually undertaken
to move from one occupation group to a "higher" one. To ascertain
the total human capital effect the regressions must be pooled across
the individual occupation strata. This is the third stage in the
analysis. Again wage equations are generated for each race-sex
group independently in order to account for and measure differences
in the structure of wage generating functions.

(IV) The "Grand Pooled" regressions - The final three equations
are pooled across j, r, and s and are constructed so as to yield
estimates of the full impact of both stratification and human capital
throughout the labor force. Race and sex dummies are added in the
last equation in an attempt to generate an estimate of the net relative
impact of crowding on overall earnings. These final equations must
be treated with all due caution because of the estimation procedure
used. The absence of interaction terms in the human capital module,
the linear form of the dependent variable, and the combining of all
race-sex groups in one equation must be taken into account when
evaluating these results. Nonetheless these last regressions are of
interest particularly when evaluated in light of other findings.

The Regression Results

The regressions presented in this section are the "best fit"
equations consistent with the estimation procedure outlined in the
preceding discussion. The R^2s for each regression have been adjusted

for degrees of freedom and the figures in the parentheses are
t-statistics. The 95 percent confidence level has been used throughout
to measure statistical significance.[1] The descriptions of each
occupation stratum are based on the mean values for the variables in
the cross race-sex equations. These can be found in Appendix B. We
begin with the lowest skilled stratum and proceed in steps to an
analysis of occupation strata having greater GED and SVP requirements.

OCCUPATION STRATUM 1-3

Jobs in the least skilled occupation stratum require no more
than a short demonstration period for the typical worker to achieve
average proficiency.[2] The average worker in this group has less
than nine years of schooling and only 8 percent have any institutional
training. Yet labor force experience averages over thirty years.
In 1967 a disproportionately large percent of this stratum's workforce
was black (27%) while a full third (33%) were women.

Half of the workforce are members of trade unions and are
employed in _industries_ which have on average 36 percent minority
employment. Within specific _occupations_ the percentage of minority
employment is even larger--43.9 percent, approximately half of whom are

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[1]Throughout the analysis there are only a few instances where
a coefficient is presented which does not meet or exceed the .05 level
of significance. These are denoted by an asterisk (*). In most of
these the coefficient is significant at better than the .10 level and
the variable reduces the standard error of the regression estimate.
In the remaining cases the coefficient is reported for comparative
purposes.

[2]This figure is based on interpolation of the SVP scale.

white women. On average each production worker in this sample had

about $20,000 worth of depreciable assets with which to work,

somewhat less than the amount in other strata. Table 5.1 contains

all of the regression results for this group.

White Males - For white men the "best fit" human capital equation

contains only schooling and the interaction term school-south as

significant variables. Together the two explain 14 percent of the

variance in earnings which average $2.71 an hour. An additional year

of schooling is valued at 7.8 cents per hour if taken in the non-south.

A year of education in the south, however, adds only one cent to the

wage rate.

The addition of the significant non-human capital variables

increases the corrected coefficient of determination $(\bar{R}^2)$ to .315

and reduces the standard error of the estimate (SEE) to less than

$.74 without significantly altering the coefficients in the human

capital module. Trade union membership adds $.32 to the wage rate

which represents a differential of approximately 13 percent over the

wage of non-union workers in this stratum. Industry segregation of the

labor force also affects earnings substantially. Ceteris paribus,

those who become "trapped" in an industry with minority employment 1σ

greater than "average" earn $.68 less (2 X .1633 X -2.0851) than workers

in industries with minority employment one standard deviation below

the average.[3] (Standard deviations are reported in Appendix B.) This

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[3]For consistency throughout the analysis the net effect of

TABLE 5.1

REGRESSION EQUATIONS:
OCCUPATION STRATUM 1-3 BY RACE AND SEX

	White Male		Black Male		White Female		Black Female		Cross Race-Sex	
Constant	2.1321	3.3632	2.1695	1.7986	.9708	2.0723	1.0822	1.8098	1.9190	3.2099
HUMAN CAPITAL MODULE										
Schooling	.0779	.0618	.0779	.0601	.0853	.0491	.0669	.0469	.0702	.0485
	(3.17)	(2.74)	(4.72)	(4.39)	(4.01)	(2.65)	(4.63)	(3.47)	(4.13)	(3.62)
School-South	-.0662	-.0559	-.0823	-.0562	----	----	-.0314	-.0157*	-.0656	-.0453
	(3.56)	(3.28)	(6.27)	(5.20)	----	----	(3.26)	(1.73)	(5.70)	(4.98)
Training	----	----	.4266	.3450	----	----	----	----	.3926	.3341
	----	----	(2.54)	(2.56)	----	----	----	----	(2.09)	(2.28)
Migration	----	----	-.3436	-.2686	----	----	-.2306	-.2734	-.2011	-.2248
	----	----	(3.54)	(3.37)	----	----	(2.78)	(3.64)	(2.03)	(2.92)
Experience	----	----	----	----	----	----	----	----	----	----
Specific Voc. Prep.	----	----	----	----	----	----	----	----	----	----
STRATIFICATION MODULE										
Union Member	----	.3204	----	.4023	----	.2068	----	.2756	----	.3769
	----	(2.45)	----	(4.56)	----	(2.07)	----	(3.57)	----	(4.62)
% Minority--Industry	----	-2.0851	----	-.7213	----	-.8593	----	-1.4104	----	-1.1829
	----	(4.85)	----	(2.86)	----	(2.97)	----	(4.21)	----	(4.03)
% Minority--Occupation	----	----	----	----	----	-.4550	----	----	----	-1.1527
	----	----	----	----	----	(2.09)	----	----	----	(5.28)
% Black Male--Occupation	----	----	----	----	----	----	----	----	----	----
% White Female--Occupation	----	----	----	----	----	----	----	----	----	----
% Black Female--Occupation	----	----	----	----	----	----	----	----	----	----
INDUSTRY MODULE										
Concentration	----	----	----	.9213	----	----	----	----	----	.3992
	----	----	----	(5.57)	----	----	----	----	----	(2.36)
Union x Conc.	----	----	----	----	----	----	----	----	----	----
After-tax Profit	----	----	----	----	----	----	----	5.0373	----	----
	----	----	----	----	----	----	----	(2.36)	----	----
Capital/Labor Ratio	----	----	----	----	----	----	----	----	----	----
Government Demand	----	----	----	1.1146	----	----	----	----	----	----
	----	----	----	(2.11)	----	----	----	----	----	----
WORKING CONDITIONS MODULE										
Physical Demands	----	-.2012	----	----	----	----	----	----	----	-.1687
	----	(1.96)	----	----	----	----	----	----	----	(2.48)
Negative Work Traits	----	----	----	----	----	-.1324*	----	----	----	----
	----	----	----	----	----	(1.90)	----	----	----	----
R^2	.142	.315	.200	.494	.204	.511	.220	.402	.187	.521
SEE	.8174	.7386	.7527	.6034	.4337	.3511	.4475	.3962	.8091	.6269
MEAN	$2.71	$2.71	$2.17	$2.17	$1.74	$1.74	$1.36	$1.36	$2.27	$2.27
N	138	138	253	253	65	65	137	137	277	277

is the first evidence of industry "crowding" affecting the distribution of earnings; it will appear many times again. We might add that this result is clearly in opposition to theories of discrimination which posit that whites must be paid premium wages to work in industries where they are forced to associate with a large number of minority group members.[4]

After the stratification variables are included in the regression, the industry variables fail to explain any additional variance in earnings. This is consistent with the "simple crowding" hypothesis where the locus of the demand curve is uniform across industries but imperfections exist in the labor supply function. Since we are dealing with white males in this instance, neither race nor sex is directly

continuous stratification and industry variables is measured over the range $\pm$ one standard deviation ($\pm 1\sigma$) about the means. (We will refer to this measure as a "one sigma" evaluation.) This measure is used rather than the traditional elasticity concept because it yields a more intuitive sense of a variable's impact on earnings. The $\pm 1\sigma$ evaluation indicates the range in hourly wages earned by homogeneous workers in industries which differ by $\pm 1\sigma$ standard deviation in concentration, profitability, "crowding," etc. By using this type of measure we are neither focusing on the extreme tails of the distribution nor the infinitesimal marginal effect indicated by elasticities. The overall impact of the stratification and industry variables will often be of larger magnitude than this, but seldom smaller. For a normal distribution, two-thirds of all observations lie within 1σ of the mean; for many other distributions including the "pyramidal," the uniform, and the bi-modal, a larger percentage of observations lie beyond 1σ making our measure somewhat conservative. See Daniel Suits, Statistics: An Introduction to Quantitative Economic Research (Chicago: Rand McNally, 1963), pp. 48-51.

[4]For a statement of this position see Gary Becker, The Economics of Discrimination (Chicago: University of Chicago Press, 1957) or Kenneth Arrow, "Some Models of Racial Discrimination in the Labor Market," RAND Publication RM-6253-RC, February 1971.

responsible for the barriers to interindustry mobility required for
a significant STRAT factor. Other factors not specified in the
equation, but probably including imperfections in labor market
information, must account for the industry distribution of white men
in this group. It is also conceivable that "lock-in" effects of
seniority and geographical immobility generate part of the wage
differential.

In the complete equation, the physical demands variable is
significant as well. But its coefficient is negative signifying that
the remuneration for heavier work is lower than for jobs requiring less
physical exertion. This inverse relationship is maintained even after
controlling for occupation stratum (GED and SVP), education, union
membership, and the race-sex composition of each industry. If this
relationship is a valid indication of the true association between
physical demands and earned income, then workers either prefer heavier
work even at the sacrifice of earnings or some workers become "trapped"
in very low wage laboring jobs and cannot easily escape to other
occupations in this or other strata. Unless we accept the implausible
first implication, this result calls into question the validity of
the "compensatory wage" theory—at least for low-skill work groups.
As it happens, the physical demands variable is seldom significant in
the overall analysis and never in the more skilled occupation strata.
The seemingly counterintuitive conclusion implied by this regression
may be due to measurement error, as we noted in a previous chapter.

Black Males - Within occupation stratum 1-3, schooling has an
identical impact on earnings for both black and white men. Although
the former average almost 1.4 years less schooling than their white
counterparts, an additional year of education for either is worth the
same, 7.8 cents per hour. Only in this stratum and in stratum 6-9
is there no significant difference between coefficients on schooling
for these two groups. In all of the other occupation strata the
partial on schooling is statistically greater for whites.

The equality in dollar returns to education within OCC STRAT
1-3 would indicate a benign condition if it were not for the fact that
internal rate of return calculations show that extra schooling is not
particularly beneficial for either white or black men as long as they
remain in this stratum. For white men the internal rate of return
based on foregone income opportunity is only 1.5 percent while that
for black men is only a little better than 2 percent given lower
opportunity costs.[5] Additional schooling is obviously not the path to

[5]The internal rate of return calculations in this analysis are
made according to the usual formula:

$$C = \sum_{t=0}^{n} \frac{E_t}{(1 + r)^t}$$

where C represents the opportunity cost of an added year of schooling
in terms of foregone earnings, E_t represents the additional earnings
in period t due to the added year of schooling and r equals the
internal rate of return. In these calculations the opportunity cost,
C, was set equal to the annual income earned by an average individual
in the occupation strata with mean years of education.

much higher lifetime incomes at least for those "trapped" within

this stratum.[6] As is, the difference in schooling completed can

explain only 20 percent of the difference in mean earnings between

the two groups based on the black male equation evaluated at the mean

value of schooling completed by white men.

As in the case of white men, southern schooling adds little (in

this case, nothing) to the wage rate of black men. But unlike the

results for the white group, both institutional training and migration

have a large impact on earnings. Training adds $.43 to hourly earnings

while the failure to emigrate reduces the wage by over $.34 an hour.

Training apparently permits the black worker to move out of the laborer

occupations (laborers, n.e.c. and farm laborers) into higher paid jobs

in this stratum such as warehousemen, metal filers, textile knitters

and loopers, and unskilled painters. Migration represents mobility to

the higher wage labor markets of the north.

The addition of the STRAT and IND modules increases the $\bar{R}^2$ to

almost .50. Union membership adds over $.40 to the wage rate; thus

the average union member in this stratum earns more than a fifth

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The annual additional earnings from an added year of schooling is assumed to be uniform from the time the individual leaves school until he retires at age 65. In this case education is considered a pure investment good and the marginal earnings profile is assumed flat. For white men in this example, $C=\$5920$; $E_t=\$156$; and $t=49$. For black men, the opportunity cost is only $4720.

[6]This conclusion is fully consistent with other findings including those of Bennett Harrison, Education, Training, and the Urban Ghetto (Baltimore: The John Hopkins University Press, 1972) and Wachtel and Betsey, op. cit.

(20.3%) more than the unaffiliated worker. In percentage as well as in dollar terms, union membership is more helpful for the black worker than the white. Stratification by industry also affects wages significantly, although it is not as important a factor for black men. A ±1σ difference in minority employment (%MININD) is responsible for a $.24 difference in earnings.

The concentration ratio or "market power factor" also affects earnings suggesting the existence of "complex crowding." A forty point difference in the MPF (e.g. .20 vs. .60) is related to a $.36 difference in earnings. In addition, the government demand variable is significant. Ceteris paribus, a ±1σ difference in government purchases means a $.16 wage differential. Apparently blacks do a little better in industries subsidized by government contracts.

White Females - Schooling is the only significant human capital variable in the white female equation; it yields approximately the same wage increment as was found in the equations for white and black men. This one factor is responsible for explaining about a fifth of the variance in earnings.

The addition of the STRAT module increase the $\bar{R}^2$ to .511 and reduces the SEE by almost twenty percent. Union membership and minority employment by industry and occupation all affect white female earnings after controlling for education. Union membership is valued at $.21 an hour yielding a percentage wage differential between union and non-union workers approximately equal to that for white men. The ±1σ evaluation of percent minority employment in the industry (%MININD) and

the percent minority in the occupation (%MINOCC) yield $.30 and $.20

differentials respectively. Taken together these three variables

disclose a considerable degree of simple "crowding." If purely

additive, the three STRAT variables suggest a potential $.71 wage

differential around a mean wage of only $1.74. As in the case of white

men, the industry module variables add nothing further to the explana-

tion of earnings for this segment of the labor force.

The nearly significant negative coefficient on "negative work

traits" can probably best be explained in terms of measurement error.

This is the only instance in which the coefficient is negative. In a

few cases the expected positive sign is found; in all others, with

this exception, the variable is insignificant.

Black Females - Once more the human capital module explains

about twenty percent of the variance in earnings. Schooling has about

the same dollar impact on the wage rate as it does for the other groups

in the occupation stratum. However, because of the extremely low mean

wage rate in this instance ($1.36), the rate of return on additional

schooling is greater than for any other race-sex group. In this case,

r > 4.25%. Training has no apparent impact on earnings although the

percentage of black females in this OCC STRATUM with training (7.3%)

is only slightly less than that for black men (9.5%). The other

significant variable in the module is migration. Remaining in the

same location after age 16 reduces the average wage by $.27 an hour,

similar to the effect seen for black men. In this stratum, migration

is an important human capital variable for blacks but not for whites,

most likely signifying the greater importance of emigration from the
south for nonwhite members of the labor force.

Both the stratification and industry modules add to the explained
variance in earnings boosting the $\bar{R}^2$ to .402 and reducing the SEE to
less than $.40. Union membership is worth $.28 an hour, somewhat
less than that for both groups of men but somewhat larger than the
impact of membership on the earnings of white women. Given the low
average wage rate for non-union black women in this stratum, unioniza-
tion increases the average wage almost 22 percent. This is approxi-
mately the same amount as for black men. The $\pm 1\sigma$ evaluation of %MININD
results in a wage differential of $.30 an hour, identical to the
impact of industry segregation on white women and only slightly more
than the impact on black men. In addition, a $\pm 1\sigma$ difference in after
tax profit rates is valued at $.18 an hour, an indication that
differences in industry demand also affects individual earnings.

For all four race-sex groups then, the stratification variables
are significant in this occupation stratum and have coefficients
of substantial magnitude after controlling for human capital. We take
this to be evidence of significant "crowding." Further analysis will
be postponed to Chapter VI.

Cross Race-Sex - Without resorting to Chow tests, it is evident
that there are some essential differences in the earnings generating
functions for the four individual race-sex groups in OCC STRATUM 1-3.
While the same key variables are significant (schooling, union
membership, and %MININD), there are two important differences in the

regressions. In the first place migration plays a prominent role

in the functions for both black groups, but has no apparent impact

on the earnings of whites. The second difference relates to the

influence of the industry module; these variables are also significant

for the black equations, but not for the white. Differences in

industry structure apparently have no systematic effect on wage

differentials within each of the two white groups after controlling

for supply side stratification. On the other hand, the wage differ-

entials for both black groups reflect "complex crowding." Put

somewhat differently, differences in both supply and demand conditions

influence the earnings distribution for blacks while differences in

labor supply conditions alone appear to account for the explained wage

differentials of similarly qualified white workers.

This structural difference in the earnings functions appears to

be related to the relative variation in the underlying distribution of

industry characteristics. The significant coefficient on the government

demand variable in the black equation may be due to the fact that

the dispersion in this factor is much greater for blacks than any

other race-sex group. The coefficient of variation for black men

is 2.2866 while for white men only 1.6779. The same can be said for

the significant coefficient on after-tax profits for black women. Here

the coefficient of variation is .713 while it is no higher than .495

for any other group. Still again this holds for concentration in

the cross race-sex equation. The absence of significant coefficients

on the industry characteristics in the white equations thus may be due

to the fact that white workers are found in relatively homogeneous industries while some blacks gain access to "permissive" economic environments and others do not. Those who do enter the more concentrated, more profitable industries earn somewhat more than their apparently misfortunate counterparts.

Although the cross race-sex equations mask these differences in the structure of the earnings functions, they nevertheless contribute to an understanding of wage determination by their ability to estimate the impact of crowding even where segregation is near perfect.

On average across race-sex groups, schooling taken outside the south contributes about $.07 to the wage rate per year of education, although southern schooling is apparently worth less than one cent. Vocational training adds $.39 to earnings while those who never migrate from their place of residence at age 16 earn $.20 less per hour. Altogether the human capital variables can explain only 19 percent of the variance in this stratum.

The addition of the remaining modules boosts the $\bar{R}^2$ to .52. The $.38 wage increment due to union affiliation is equivalent to an 18 percent differential between union and non-union workers, a figure closely in correspondence with the early institutional results of Levinson and similar to the more recent figures given by Lewis and Stafford.[7] At least for this occupation stratum, the early

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[7]Levinson reported 14-18 percent in his early calculations; Stafford 10-16 percent; Lewis 10-14 percent. See Harold Levinson, "Unionism, Wage Trends, and Income Distribution, 1914-1947," Michigan

institutional results based on industry data were not badly biased
by the exclusion of human capital variables.

Both %MININD and %MINOCC are significant as well, together
contributing substantially to wage differentials. The $\pm 1\sigma$ evaluations
are worth \$.44 and \$.58 per hour respectively. If union membership
and the two minority employment variables are strictly additive,
market restriction induced crowding accounts for a measured wage
interval of \$1.40 around a mean wage of \$2.27. Differences in the
concentration ratio add another \$.21 to the total measured wage differ-
ential. But how much of this is due to crowding and how much to
"pure" discrimination?

Equation (I) is the pooled regression with race and sex
variables added.

(I)

$$w = 3.1451 + .0452 \text{ Schooling} - .0378 \text{ School-South} + .3375 \text{ Training}$$
$$\qquad\qquad (3.45) \qquad\qquad (4.15) \qquad\qquad\qquad (2.37)$$

$$\quad - .2061 \text{ Migration} + .3664 \text{ Union Member} - 1.0019 \text{ %MININD}$$
$$\quad\; (2.77) \qquad\qquad\quad (4.62) \qquad\qquad\qquad (3.51)$$

$$\quad - .7489 \text{ %MINOCC} + .3887 \text{ Concentration} - .1687 \text{ Physical Demands}$$
$$\quad\; (3.27) \qquad\qquad\quad (2.38) \qquad\qquad\qquad (2.41)$$

$$\quad - .2439 \text{ Black}_D - .3958 \text{ Female}_D \qquad R^2 = .558 \qquad SEE = .6042$$
$$\quad\; (2.74) \qquad\quad (3.86)$$

Business Studies, Vol. X, No. 1 (Ann Arbor: Bureau of Business Research,
Graduate School of Business, University of Michigan, 1951); Frank
Stafford, op. cit.; and H. Gregg Lewis, Unionism and Relative Wages
in the United States (Chicago: University of Chicago Press, 1963).

The coefficients on %MININD and %MINOCC both decline after adding the race and sex dummies, but the fall is not especially precipitous. The largest decline is from -1.1527 to -.7489 for the coefficient on %MINOCC, but even this reduction is not particularly significant. The t-statistic for a difference in the two coefficients using the test of means is only 1.27, well below the level necessary for a clear indication of statistical difference.

TABLE 5.2

REGRESSION COEFFICIENTS ON THE STRATIFICATION
VARIABLES IN THE POOLED OCC STRATUM
1-3 REGRESSIONS

	UNION	%MININD	%MINOCC
Without R,S Dummies	.3769	-1.1829	-1.1527
(t values)	(4.62)	(4.03)	(5.28)
With R,S Dummies	.3664	-1.0019	- .7489
(t values)	(4.62)	(3.51)	(3.27)
Reduction due to R,S Dummies	.0105	.1810	.4038
	2.8%	15.3%	35.0%

Union membership, %MININD, and %MINOCC are obviously not mere proxies for race and sex, nor is the market power factor. Even after the race and sex dummies are added, the total measured wage interval for the stratification module is $1.12, eighty percent of its previous value.

Together with the evidence from the individual race-sex equations, the pooled regressions demonstrate that crowding, at least within this one occupation stratum, is a conspicuous factor in determining the distribution of earned income. In addition to "pure" wage discrimination, industry crowding seems to perform an essential function in determining wage rates for each race-sex group, including that of white men. Occupational segregation is also an important factor particularly for white women. Finally unionization plays a substantial role in the wage determination process, a finding consistent with institutional analysis. Beyond these restrictions on the supply side, the market power factor is significant suggesting that demand side characteristics affect earnings, again in perfect accord with traditional institutional theory.

OCCUPATION STRATUM 5

Occupation stratum 5 is composed mainly of semi-skilled manual workers. Almost two-thirds of the white men in this stratum are found in jobs under the single occupation title, "operatives and kindred workers, n.e.c." Similarly 55 percent of the black men are found in this occupation group with another 22.4 percent being janitors and sextons. White women are less concentrated in the operatives category; 38.8 percent are found here while another 14 percent are clerk typists, 12.7 percent are manufacturing checkers and examiners, and 11.5 percent are assemblers. For black women, 45.4 percent are operatives. With the exception of typists, OCC

STRATUM 5 is the traditional semi-skilled blue-collar workforce.

The average full-time worker requires between one and three months of specific vocational preparation to perform his or her job adequately. ($\overline{SVP}$=2.9) The typical worker had a little more than nine and a half years of formal schooling and almost 11 percent have participated in some form of institutional training program. Average experience in the labor force is thirty years. Eleven percent of this occupation stratum is black while 39 percent is female.

The industries in which these individuals work appear in the aggregate statistics to be similar to those in which workers in OCC STRATUM 1-3 are employed. A little more than half of the workforce in stratum 5 are union members while the average minority employment in these industries was 35 percent. Each worker has slightly more capital to work with: $24,000 vs. $20,000 in depreciable assets/ production worker in stratum 1-3. The historical average after-tax profit rate is about .8 percentage points higher.

White Males – The average wage rate for white males in this group is $2.87, 16 cents higher than in occupation stratum 1-3. The "best fit" human capital equation explains 16 percent of the variance in earnings with schooling, school-south, and migration each contributing to the regression. An additional year of school is valued at $.12 per hour except in the south where it returns two cents less. Migration is worth $.18 an hour, migrants earning some 6.6 percent more than those who have not moved since age 16.

The addition of the STRAT and Industry modules increase the $\bar{R}^2$
to .234. Unlike its positive effect on the other groups of workers
in this stratum, union membership does not appear to affect white
male earnings. <u>Ceteris paribus</u>, the two-fifths of white males in this
stratum who are not members of a trade union earn the same amount as
the 60 percent who are. Industry segregation, however, does have some
effect on relative earnings. The $\pm 1\sigma$ evaluation of %MININD is valued
at 23 cents an hour. This is far less than in OCC STRATUM 1-3, but
nevertheless still substantial. Concentration is the only significant
industry variable; after its addition to the equation no other industry
variables are significant at the .05 level. A similar $\pm 1\sigma$ evaluation
of concentration suggests a \$.38 wage differential.

The positive coefficient on concentration in the face of an
insignificant union membership variable cannot be easily explained.
One possibility is that union membership is sufficiently colinear
with either concentration or %MININD that its real significance is
not registered in the regression.[8] This hypothesis, however, is
belied by the fact that after the introduction of the human capital
module, the addition of union membership alone still does not yield a
coefficient which is significant at the .05 level. An alternative
explanation relies on the theory that <u>relative</u> wages are not correlated
with unionization because of the "spillover" effects or "sympathetic"

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[8]The zero order correlation between union membership and concen-
tration is .229; between membership and percent minority employment
in an industry (%MININD), -.244.

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TABLE 5.3

REGRESSION EQUATIONS:
OCCUPATION STRATUM 5 BY RACE AND SEX

	White Male		Black Male		White Female		Black Female		Cross Race-Sex	
Constant	1.8370	1.9263	2.1246	1.6893	1.3942	.7647	.0355	1.2803	1.8284	2.4466
HUMAN CAPITAL MODULE										
Schooling	.1221	.1033	.0733	.0478	.0678	.0484	.1362	.0982	.0816	.0600
	(8.54)	(7.38)	(5.39)	(4.47)	(3.70)	(2.97)	(5.51)	(4.31)	(6.86)	(5.61)
School-South	-.0252	-.0254	-.0418	-.0242	-.0215	-.0149*	---	---	-.0316	-.0251
	(2.72)	(2.85)	(3.94)	(2.92)	(2.39)	(1.87)	---	---	(4.65)	(4.18)
Training	---	---,	---	---	---	---	---	---	.3058	.3118
	---	---	---	---	---	---	---	---	(3.05)	(3.58)
Migration	-.1827	-.1540	-.3016	-.2120	---	---	---	---	-.1664	-.1349
	(2.32)	(2.05)	(3.24)	(2.91)	---	---	---	---	(2.73)	(2.54)
Experience	---	---	---	---	---	---	.0177	.0121	---	---
	---	---	---	---	---	---	(3.21)	(2.42)	---	---
Specific Voc. Prep.	---	---	---	---	---	---	---	---	---	---
STRATIFICATION MODULE										
Union Member	---	---	---	.6240	---	.2525	---	.2720	---	.2625
	---	---	---	(8.16)	---	(3.36)	---	(2.88)	---	(4.68)
% Minority--Industry	---	-.8005	---	-.5723	---	---	---	-.5404	---	-1.1728
	---	(2.91)	---	(2.34)	---	---	---	(1.96)	---	(6.22)
% Minority--Occupation	---	---	---	---	---	---	---	-.4403	---	-.4564
	---	---	---	---	---	---	---	(1.94)	---	(2.57)
% Black Male--Occupation	---	---	---	---	---	---	---	---	---	---
% White Female--Occupation	---	---	---	---	---	---	---	---	---	---
% Black Female--Occupation	---	---	---	---	---	---	---	---	---	---
INDUSTRY MODULE										
Concentration	---	.6848	---	.8154	---	---	---	.5214	---	.4502
	---	(4.74)	---	(6.21)	---	---	---	(2.65)	---	(3.64)
Union x Conc.	---	---	---	---	---	---	---	---	---	---
After-tax Profit	---	---	---	---	---	10.2611	---	---	---	5.3120
	---	---	---	---	---	(4.20)	---	---	---	(2.54)
Capital/Labor Ratio	---	---	---	---	---	.0104	---	---	---	.0019
	---	---	---	---	---	(5.15)	---	---	---	(3.80)
Government Demand	---	---	---	---	---	2.8019	---	---	---	---
	---	---	---	---	---	(2.26)	---	---	---	---
WORKING CONDITIONS MODULE										
Physical Demands	---	---	---	---	---	---	---	-.2574	---	---
	---	---	---	---	---	---	---	(2.24)	---	---
Negative Work Traits	---	---	---	---	---	---	---	---	---	---
R^2	.158	.234	.141	.495	.055	.292	.165	.378	.099	.333
SEE	.8189	.7831	.7467	.5758	.7043	.6131	.6173	.5413	.8705	.7524
MEAN	$2.87	$2.87	$2.39	$2.39	$2.01	$2.01	$1.86	$1.86	$2.48	$2.48
N	444	444	277	277	295	295	158	158	823	823

pressure of potential union organizing attempts. Non-union firms may pay union scale to forestall organizing drives. In this case, while unions may have an impact on absolute wage levels for all workers, there is no discernible effect on relative inter-industry rates. Concentration can still play a role in wage determination under these circumstances. It measures the ability of an industry to meet the prevailing standard set through collective bargaining in unionized sectors of the economy.

Black Males – The structure of the regression equation for black males in OCC STRATUM 5 is similar to that of white males with the exception of a significant and extremely powerful union membership factor. The human capital equation explains 14 percent of the variance in earnings with the same variables as in the white male equation. However, the effect of schooling on earnings is significantly lower for black men. An additional year of education increments the average wage by only 7.3 cents compared with over 12 cents for white men. This is a significant difference at better than the .02 level according to the standard test for a difference in means.[9] Using the internal rate of return method presented previously, the return for white males is approximately 3.5 percent while that of black men is less than 2.0.

As expected, migration pays off somewhat more handsomely for black men than for whites in the same occupation stratum. Again this is taken to reflect the importance of migration from the south.

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[9] $t' = 2.47$.

Within OCC STRATUM 5, membership in a trade union is critically important in the earnings function for black men. On average, black workers of this skill level who do not have access to a union earn $.62 less an hour. Union members thus earn 30.5 percent more than non-union workers, a percentage much larger than most institutional estimates with the exception of those reported in the research of Johnson and Youmans.[10] Semi-skilled manual black workers apparently are found in two kinds of industries: relatively high wage unionized industries where they are paid wages not far below that of their white male counterparts and relatively low wage non-union industries where they comprise a disproportionate share of the workforce. Which industry sector an individual can enter is crucial in determining his income.

The minority employment factor also helps to explain some of the variance in earnings. The $\pm 1\sigma$ evaluation of %MININD is valued at $.18 an hour. Concentration influences the wage rate as well. In this instance, the $\pm 1\sigma$ evaluation results in a hefty $.48 earnings differential for similarly qualified workers. The combined addition of the two stratification variables and the market power factor increases the $\bar{R}^2$ from .141 to .495 and reduces the standard error of the estimate from $.75 to $.58. Quite clearly the stratification theory explains a large part of the variance for this segment of the labor force.

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[10]See Johnson and Youmans, op. cit.

White Females - The "best fit" human capital equation does not explain much of the variance in earnings ($\bar{R}^2$=.055) for white women in this stratum. An additional year of schooling adds significantly less to average earnings than it does for white men and the internal rate of return on additional schooling is no more than that for black men (2.0%). Schooling taken in the south is worth only 4.5 cents per hour per year. None of the other human capital factors are significant at all.

Union membership is the only variable that appears in the stratification module. Membership adds $.25 to the wage rate over non-union workers in this group, an addition of 13 percent. The absence of %MININD and %MINOCC may be due to colinearity with the union membership variable, but this seems unlikely given the relatively small zero order correlations between these variables:

	Union Membership
%MININD	-.146
%MINOCC	-.099

Concentration was highly significant when regressed alone on white female earnings, but it consistently tended to undermine the integrity of the human capital module. Thus it was deleted according to the estimation procedure and three other variables were used as "quasi"-instruments: after tax profits, the capital/labor ratio, and government demand. Each of these variables measures some facet of "ability to pay" with the ±1σ evaluations yielding wage differentials of $.34, $.42, and $.18 respectively. Whether these effects are

strictly additive was not tested. After the introduction of the STRAT and IND modules, the coefficient of determination rose to .292 and the SEE declined by $.09. Once again the institutional hypotheses appear to be valid after controlling for human capital.

Black Females - Unlike the white female results, both schooling and experience are important variables in explaining the wage distribution for black women in this stratum. Together these two explain 17 percent of the variance in earnings. Schooling is particularly powerful adding 13.6 cents an hour to the wage rate per year of education. This translates into a rate of return of 7 percent, much higher than for any of the other race-sex groups. For some unexplained reason, southern schooling does not detract from this return. Every additional year of labor force experience also appears to augment earnings, in this case by 1.8 cents per hour.

The stratification module is powerful as well. Both %MININD and %MINOCC are significant factors as well as union membership. Unionization adds about the same amount to earnings as it does for white women, $.27. In addition, the $\pm 1\sigma$ evaluations of %MININD and %MINOCC are valued at $.22 and $.18 respectively.

As in the equations for white and black men, concentration is also significant indicating a substantial degree of "complex crowding." The $\pm 1\sigma$ evaluation of the market power factor indicates a $.30 wage differential. Altogether, evaluation of the stratification and industry variables suggests a $.97 wage interval around a mean of $1.86.

The physical demands variable is significant in this equation as well, but once again its coefficient is of the "wrong" expected sign. The negative sign may be explained by the possibility of black female "entrapment" as janitresses. This is a particularly low wage job which has relatively heavy physical demands although the educational and training requirements are not especially lower than for operatives or assemblers.

When all of the variables are added, the complete equation explains more than twice the variance explained by the human capital module alone. Thus even here where the human capital variables are relatively powerful, stratification factors still play a significant role in wage determination.

<u>Cross Race-Sex</u> - The human capital equation for the pooled regression explains only 10 percent of the variance in earnings within OCC STRATUM 5. In this regression additional years of schooling are worth $.08 per year except in the south where they return only $.05. Migration is also significant reflecting the importance of this variable for both groups of men as suggested in Chapter III. In addition, however, the training variable turns out to be powerful ($.31) and significant at more than the .01 level. Training was never significant within the individual race-sex equations thus suggesting the possibility that training has an effect on wages <u>between</u> races or sexes but not within them.

There is a bit of evidence in the data that training opportunities are greater for men than for women, at least in this occupation stratum.

Thirteen percent of white males in this group had some institutional

training and 12 percent of black men. However, only 7 percent of white

females and an insignificant number of black women were exposed to

vocational training. It is then possible that differences in training

within the white male group, for instance, are not important enough

to be manifest in a significant coefficient. However the difference

in training opportunities between white men and black women, for

example, may be great enough to generate the large positive coefficient

found on this variable. This conclusion is enhanced by the fact that

once the race and sex variables are added into the complete equation,

the coefficient on training falls from .3118 to .1898.[11] All of this

may be taken as evidence that the "structure" of human capital endowments

is important in addition to its absolute "quantity."

Inclusion of the stratification and industry modules more than

triples the $\bar{R}^2$ and reduces the SEE by $.12. Union membership is worth

$.26 an hour while the two minority employment variables are valued

at $.41 and $.16 according to our standard $\pm 1\sigma$ evaluation. The

impact of industry segregation is thus nearly identical in both this

stratum and the lower skilled 1-3 group. This is not true for occu-

pational segregation. In the former stratum the standard evaluation

of %MINOCC furnished a $.58 wage differential. This should come as no

surprise, however. Occupation stratum 1-3 includes a broad range of

specific jobs while group 5 is overwhelmingly composed of industry

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[11]An identical phenomenon will be found in the "grand" pooled
regression reported later in this chapter.

operatives. In this case we would expect to find the major differences in earnings related to industry attachment rather than occupational category. Occupational crowding plays a role in wage determination even here, but apparently a minor one.

Concentration, after-tax profits, and the capital/labor ratio are also significant in the pooled regression. Summed together the three are worth a substantial $.64 an hour based on the standard evaluation.

Adding race and sex dummies to the complete equation seriously affects the coefficients on the STRAT and IND variables as well as the value of the training parameter. Equation (II) reports these results.

(II)

$$w = 1.8742 + .0613 \text{ Schooling} - .0205 \text{ School-South} + .1898 \text{ Training}$$
$$ (6.13) (3.60) (2.34)$$

$$- .1494 \text{ Migration} + .4012 \text{ Union Member} - .4138 \text{ MININD}$$
$$ (3.03) (4.43) (2.13)$$

$$- .1944 \text{ MINOCC} + .7027 \text{ Concentration} - .4754 \text{ Union x Conc.}$$
$$ (1.07) (4.56) (3.63)$$

$$+ 7.0780 \text{ After Tax Profit} + .0016 \text{ Capital/Labor Ratio}$$
$$ (3.20) (3.20)$$

$$+ 1.5487 \text{ Government Demand} - .1620 \text{ Physical Demands}$$
$$ (2.71) (2.57)$$

$$- .3246 \text{ Black} - .6704 \text{ Female} \qquad R^2 = .433 \qquad SEE = .6955$$
$$ (4.09) (11.04)$$

After the inclusion of race and sex, three more variables become significant while %MINOCC drops out of the equation. For one, the union-concentration interaction term is now significant. Evaluating

this regression for union and non-union workers and at .20 and .60

concentration ratios (as was done by Weiss) elicits the impact of

unionization under competitive vs. oligopolistic conditions. It also

demonstrates the impact of the market power factor in a unionized

industry vs. an industry not covered by collective bargaining. Among

generally competitive industries with workers in OCC STRATUM 5,

union affiliation increases the average wage by $.31 an hour or 13.7

percent according to evaluation of the regression equation at different

levels of concentration and unionization. In the more concentrated

industries union membership is capable of increasing earnings by $.11

an hour or 4.6 percent. Alternatively, greater concentration (from

.20 to .60) raises earnings by about 12.6 percent in non-union

Concentration (MPF)

	20%	60%	
No union	$2.23	$2.52	+12.6%
Union	$2.54	$2.63	+ 3.6%
	+13.7%	+4.6%	+17.9%

industries and by 3.6 percent when a union is present. These results

are more consistent with those of Stafford than Weiss in that both

unionization and concentration are still significant after controlling

for the human capital variables.[12] Workers who end up in concentrated

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[12]Recall that in Weiss's study, the addition of personal
characteristics to the regression all but destroyed the significance
of the concentration term. The statistically significant coefficients

unionized industries earn approximately 18 percent more than nonunion labor in the competitive sector.

In addition to the now significant interaction term, government demand also affects wage determination in this stratum. A $\pm 1\sigma$ evaluation of its coefficient elicits an additional $.14 difference in earnings. Physical demands is the third newly significant variable after the addition of race and sex. Its coefficient is negative, possibly displaying once again the "entrapment" of black females in low wage physically demanding jobs.

The coefficient on the race dummy is -$.32 while that on sex is -$.67. After the inclusion of both variables the coefficient on %MININD declines precipitously from -1.1728 to -.4138 and %MINOCC becomes totally insignificant. Clearly only a portion of the wage differential between race-sex groups in this stratum can be positively identified as directly linked to industrial and occupational crowding. Much of the differential may be due to either pure wage discrimination within specific industries or occupations or due to segregation between firms rather than between industries. The high degree of colinearity between the dummies (i.e. sex) and the minority employment variables makes it impossible to definitively differentiate these effects. (See Table 5.4.)

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in our results can be explained by the improvement in the measurement of concentration (through the use of the "market power factor") and the micro measurement of union membership. See Leonard Weiss, op. cit., p. 108.

TABLE 5.4

PARTIAL (X^tX) MATRIX FOR OCCUPATION STRATUM 5

	Race	Sex	%MININD	%MINOCC
Race	1.000	-.062	-.039	-.060
Sex		1.000	.451	.420
%MININD			1.000	.302
%MINOCC				1.000

Nevertheless the consistent appearance of the STRAT variables in the individual race-sex equations suggests an extensive degree of crowding and together with the race-sex variables demonstrates an even larger degree of overall stratification. Within the full labor force (at least within stratum 5) there are large wage differentials tied to factors which measure racial and sexual discrimination—in one form or another—after controlling for differences in human capital endowments. In addition there is strong evidence that substantial imperfections exist within this stratum's labor market even for white males. In this sense the traditional institutionalist and social stratification arguments are strongly upheld by both the individual race-sex equations and in the pooled regressions.

OCCUPATION STRATUM 6-9

Occupation stratum 6-9 is composed of a broad range of specific occupations which demonstrate a definite distinction between "men's"

and "women's" work and "white" and "black" work in the American

economy. This particular stratum is also noted for being the most

heterogeneously skilled of the five occupation groups used in this

analysis. Each of its specific occupations falls within a narrow

range of required "general educational development" (GED) but

potentially spans a wide range of "specific vocational preparation"

(SVP) requirements. On-the-job training can range from just six

months to, in rare cases, almost ten years (see Appendix A). For

this reason many of the results are not comparable to those found

in other more narrowly defined strata. In the whole spectrum of

occupations from least to most skilled, we will find the regression

results for this group to be the most anomalous.

Over 46 percent of white men in this stratum are found in just

four specific occupations: truck and tractor drivers, general (semi-

skilled) carpenters, welders, and policemen. The four most popular

occupations for black men include truck drivers, but the other three

are shipping and receiving clerks, stock clerks, and hospital attendants.

Almost 55 percent of all black men in this stratum are found in these

occupations.[13]

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[13]This comparison probably understates the difference in occupa-
tion categories for white and black men. There is no distinction
between long-haul and intra-city trucking in the specific occupation
categories given by the census. If such data were available it would
probably indicate that white men dominate inter-city trucking while
most black truck drivers are found on local routes. Earnings are
considerably different for the two kinds of work.

White women are found in a different set of occupations altogether. Almost 60 percent are found in just three occupations: sewers and stitchers, hospital attendants, and receptionists. More than 74 percent of black women are consigned to jobs as hospital attendants, practical nurses, and sewers and stitchers in the apparel industry. This extreme occupational segregation is one of the main determinants of wage differentials according to the regression analysis.

The average worker in OCC STRATUM 6-9 had no more formal education than the typical worker in OCC STRATUM 5, nor any longer labor force experience. However the specific on-the-job training required for these occupations is somewhat greater, as we noted, taking in most cases between six months and a year to complete and in a few cases more. Almost 13 percent of the workforce reported enrollment at some time in an institutional training program. Only 9 percent of the workers in this stratum are black and only 27 percent are female.

Again over half of the stratum's workforce are members of trade unions, but the variance by race-sex group is extreme.[14] Fifty-six

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[14]The large variance in union membership by race and sex is found not only in occupation stratum 6-9 but in all other strata as well. White men are more organized than black men and both male groups always exceed the unionization rates for both groups of women. The mean union membership rates by stratum are reproduced below. (See Appendix B.)

	Union Membership Rates (%)				
Occupation Stratum	1-3	5	6-9	12-14	15-17
White Males	58%	60%	56%	44%	11%
Black Males	47	55	44	37	n.a.
White Females	32	41	43	10	10
Black Females	29	47	40	n.a.	n.a.
Total Workforce	50%	52%	52%	38%	11%

percent of white men are union members; but only 44 percent of black

men; 43 percent of white women and 40 percent of black females.

The average occupation has a minority workforce of approximately 30

percent, but as expected the standard deviation for %MINOCC is as

large as the mean.[15] What is ironic about OCC STRAT 6-9 is that the

segregation of the workforce appears to be so complete that the strati-

fication and industry variables are not particularly important <u>within</u>

individual race-sex regressions. In this case, only the pooled

regressions can uncover the effect of "crowding" due to racial and

sexual segregation. Table 5.5 contains the regressions for this

stratum.

<u>White Males</u> - Both the human capital equation and the complete

equation for white males have few significant variables. Only

schooling is important in the HC module and this one variable explains

only 6.3 percent of the variance. An additional year of education is·

worth a relatively small $.09 an hour.

The important factor in this stratum is union membership.

Consistent with what is generally known about the specific occupations

in this stratum, unionization is worth more than $.76 an hour thus

forging a 28 percent wage differential between union and non-union

workers. In no other occupation group is union membership so important

for white men. In addition, there is a significant coefficient on the

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[15]The actual coefficient of variation on %MINOCC is 1.08 while
that on %MININD is .63.

TABLE 5.5

REGRESSION EQUATIONS:
OCCUPATION STRATUM 6-9 BY RACE AND SEX

	White Male		Black Male		White Female		Black Female		Cross Race-Sex	
Constant	2.0699	1.9847	2.2122	1.6901	1.9361	1.6422	1.2439	1.5608	1.2216	2.6503
HUMAN CAPITAL MODULE										
Schooling	.0927	.0791	.0764	.0597	---	---	.0678	.0506	.0560	.0511
	(4.30)	(4.04)	(3.45)	(2.96)	---	---	(2.29)	(2.23)	(3.15)	(3.45)
School-South	---	---	-.0477	-.0275	---	---	-.0333	-.0317	-.0318	-.0196
	---	---	(3.27)	(2.02)	---	---	(2.50)	(3.18)	(3.05)	(2.18)
Training	---	---	---	---	---	---	---	---	---	---
Migration	---	---	-.5384	-.3526	-.1917	-.1014*	---	---	---	---
	---	---	(4.18)	(2.93)	(2.08)	(1.12)	---	---	---	---
Experience	---	---	---	---	---	---	---	---	---	---
Specific Voc. Prep.	---	---	---	---	---	---	---	---	.2021	---
	---	---	---	---	---	---	---	---	(4.62)	---
STRATIFICATION MODULE										
Union Member	---	.7647	---	.5961	---	.3328	---	.4966	---	.6746
	---	(7.28)	---	(4.42)	---	(3.54)	---	(4.57)	---	(8.21)
% Minority--Industry	---	---	---	---	---	---	---	---	---	-1.2192
	---	---	---	---	---	---	---	---	---	(4.37)
% Minority--Occupation	---	---	---	---	---	---	---	---	---	-.7525
	---	---	---	---	---	---	---	---	---	(3.73)
% Black Male--Occupation	---	-2.5825	---	---	---	---	---	---	---	-2.4924
	---	(2.31)	---	---	---	---	---	---	---	(2.67)
% White Female--Occupation	---	---	---	---	---	---	---	---	---	---
% Black Female--Occupation	---	---	---	---	---	---	---	-4.4168	---	---
	---	---	---	---	---	---	---	(2.86)	---	---
INDUSTRY MODULE										
Concentration	---	---	---	.6535	---	.6042	---	---	---	---
	---	---	---	(2.77)	---	(2.57)	---	---	---	---
Union x Conc.	---	---	---	---	---	---	---	---	---	---
After-tax Profit	---	---	---	---	---	---	---	---	---	---
Capital/Labor Ratio	---	---	---	---	---	---	---	---	---	---
Government Demand	---	---	---	---	---	---	---	-6.0458	---	---
	---	---	---	---	---	---	---	(3.52)	---	---
WORKING CONDITIONS MODULE										
Physical Demands	---	---	---	---	---	---	---	---	---	---
Negative Work Traits	---	---	---	---	---	---	---	---	---	---
R^2	.063	.238	.156	.320	.040	.166	.187	.620	.091	.380
SEE	.9506	.8601	.8725	.7874	.4733	.4453	.4416	.3140	.9563	.7927
MEAN	$2.96	$2.96	$2.36	$2.36	$1.84	$1.84	$1.72	$1.72	$2.60	$2.60
N	279	279	186	186	106	106	43	43	423	423

variable for percent black male employment in an occupation (%BMOCC).
The usual $\pm 1\sigma$ evaluation of this factor yields an added wage
differential of $.24 an hour. Together these two stratification
factors are thus valued at $1.00 or just slightly less than a third
of the average wage. After their addition, the industry module adds
nothing suggesting that differences in demand characteristics mean
relatively little if anything after supply constraints play their role.
While not an especially well-specified equation, the regression indicates
that (1) differences in human capital are not particularly important
in explaining wage differentials within this stratum and (2) that
labor market stratification is the main actor in determining the
distribution of earnings.

Black Males - The black male equation is similar to that of white
men with the exception of the importance of migration and concentration.
An additional year of schooling is worth 7.6 cents an hour which
according to the means test is not significantly different from the
schooling coefficient for white men in this stratum.[16] Again however,
as in OCC STRATUM 1-3, the rates of return on additional schooling
are so low for both groups that this apparent equality is not
especially valuable for black men. Schooling in the south is worth
even less, yielding only $.03 an hour.

As in every other black male regression, migration is highly
significant and powerful. Those who do not migrate during their

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[16] $t' = .57$.

lifetime earn $.54 less per hour. For a full-time full-year worker
this is equivalent to almost $1100 a year.

As noted previously, industry and occupation segregation by
race and sex can be so extensive that %MININD and %MINOCC would not
be significant variables within individual equations. This is
apparently true for the black male regression. Neither of these
variables is significant. However, union membership is, and once
again as in OCC STRATUM 5 its effect is robust. There is a $.60
wage gap between union and non-union workers which represents a 28
percent differential exactly the same as for white men. This is
roughly equivalent to the difference in wages found between a black
unionized maintenance painter ($2.75) and a skilled non-union hospital
attendant ($2.15).

After the inclusion of union membership, concentration adds to
the wage differential as well suggesting a case of complex crowding.
Unlike for white men, industry demand characteristics apparently
affect relative wages. The $\pm 1\sigma$ evaluation is worth 35 cents an hour.
With unionization and concentration included in the regression, the $\bar{R}^2$
more than doubles to .320 and the SEE declines by $.085.

White Females - The human capital equation for white women in
this group explains only four percent of the variance and neither
education, training, experience nor specific vocational preparation is
significant in this regression. Only migration is significant and
its coefficient is a relatively small -$.19. The addition of union
membership and concentration raises the $\bar{R}^2$ to .166, although this occurs

only after the estimation rule concerning the integrity of the human capital module is violated. Union membership is worth $.33 an hour or 19.7 percent. The ±1σ evaluation of the concentration ratio is valued at 23 cents an hour. Although this regression is not particularly well fitted, it suggests that within this stratum almost all of the explained variance in earnings is due to industrial and occupational attachment. This is not an unreasonable conclusion given the heterogeneous set of "women's" occupations represented in STRATUM 6-9, all of which have very similar GED and SVP ratings but differ in terms of industrial characteristics.

Black Females - In contrast to the white female equation, the regression for black women is quite servicable. The human capital module explains almost 19 percent of the variance with the two variables schooling and school-south. An additional year of education is worth 6.8 cents excepting the south where its value is less by 3.3 cents.

The addition of the STRAT and IND modules increases the $\bar{R}^2$ to .620, the highest of any equation in the analysis. The standard error of the estimate is only $.31 after the introduction of these modules. Union membership is worth almost $.50 an hour. This represents a 33 percent differential between union and non-union workers. A further indication of the effects of labor market crowding is found in the ±1σ evaluation of percent black female employment in an occupation (%BFOCC). This yields an additional differential of $.30. For occupations that are even more "impacted" with black females the effect is, of course, larger. The wage rate for hospital attendants,

for example, is $.57 an hour lower than in occupations with only the average percentage of black females. Quite obviously occupational "crowding" severely affects earnings in this stratum.

In the industry module there is an unexpected sign on the government demand variable. Here we find that a ±1σ increase in government demand apparently lowers the wage rate of black women by nearly $.19 an hour. This is the only instance in the entire analysis when a statistically significant government demand variable had a negative coefficient. This rather puzzling result was found to be merely a function of the peculiar industry composition in the micro data for this regression.[17] No other industry variables were significant so that our overall assessment is one of "simple"--but extensive--crowding.

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[17]Since we do not have a measure of government demand for the "hospital" industry in our data set, the coefficient cannot be due to the lower wages paid to hospital attendants in government subsidized hospitals. Another solution was necessary. The puzzle was finally solved after perusing the original data on government purchases by industry. The weighted mean level of government expenditures in the industries in this regression was 2.8 percent of gross sales. There is one industry in the whole data set which sells a larger percentage of its product to the government and also employs a relatively large number of black women in this occupation stratum. This industry is "Miscellaneous Fabricated Textile Products" employing a large number of sewers and stitchers. It sells over 4.5 percent of its annual production to government agencies. With a low market power factor (.1043), a relatively low profit rate (2.5%), and an extremely high proportion of minority workers (60.7%), the average wage rate in the industry is relatively low ($2.10 an hour in 1967). Black women, according to the data, have little access to other industries which have large government contracts, but also higher average wages. Consequently, in this single case, there is a negative relationship between government purchases and individual earnings. This result is not inconsistent with the general stratification theory.

Cross Race-Sex - Because of the extensive occupational segregation in this stratum by both race and sex, there is a strong tendency for the individual equations to underestimate the impact of crowding on the distribution of earnings. Consequently the pooled regressions may give better estimates of its effect.

In these equations the human capital variables are responsible for explaining only 9.1 percent of the variance in earnings. Formal schooling has a relatively weak impact on wages, an additional year adding only 5.6 cents to hourly earnings and less than half as much if the schooling was completed in the south. However, for the first time in the analysis, specific vocational preparation is significant suggesting the critical nature of on-the-job training in the occupations within this group. The fact that SVP is statistically significant in the pooled regression while insignificant in each of the individual equations suggests that access to jobs which provide apprenticeship (or other forms of investment in OJT) is linked directly to race and sex. White males have freest access to training while the other race-sex groups are provided with a lower average level of SVP.[18]

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[18]The mean SVP scores for each race-sex group are:

	$\overline{SVP}$	σ_{svp}
White Males	4.79	1.15
Black Females	4.37	.82
White Females	4.35	.78
Black Males	4.33	.93
Cross Race-Sex	4.65	1.07

The addition of the STRAT variables compromises the integrity of
the human capital module in that SVP now disappears from the
regression. In this case we have permitted this to occur for while
the letter of the estimation procedure is violated, we feel its
"spirit" is not. The original intent of using a surrogate "two-stage"
regression was to account for the sequential relationship between an
individual's acquisition of human capital and his or her subsequent
attachment to a specific industry and occupation. In the special case
of SVP the presumed causal ordering is often the reverse. On-the-
job training such as apprenticeship is only available _after_ a worker
has gained access to a particular job or occupation. If access is
denied on the basis of race or sex, as it often appears to be in this
group of occupations, then SVP acts more as a proxy for stratification
than a traditional human capital factor. Not to violate the original
estimation procedure under these circumstances would lead to
seriously downward biased estimates of the effects of industrial and
occupational segregation.

Before the race and sex factors are added to the complete
equation, the introduction of the stratification module boosts the $\bar{R}^2$
to .38 and lowers the SEE by over 16 cents. Union membership alone
is worth $.67 an hour; those in organized industries or occupations
consequently earn a full 30 percent more than those who are not. In
addition, %MININD, %MINOCC, and %BMOCC are all highly significant.
If strictly additive, the sum of the $\pm 1\sigma$ evaluations is worth over
$1.30 an hour, half the mean wage rate. Although quite hefty, this

result is by no means unreasonable. It constitutes a differential not much larger than the actual differences in mean earnings between white men and white and black women. After the stratification module variables are added, none of the industry variables are significant. "Simple" crowding appears here to be the rule.

As expected the introduction of the race and sex factors severely reduces the strength of the variables in the stratification module with the exception of unionization. With the extreme occupation segregation found in this stratum, the complete pooled regression attributes much of the variance in earnings due to what we feel is occupational attachment to the micro measured race and sex dummies.[19] Equation (III) is the "best fit" complete regression including these variables.

(III)

$$w = 1.8476 + .0532 \text{ Schooling} + .0799 \text{ SVP} + .6963 \text{ Union Membership}$$
$$(3.74)\phantom{ \text{ Schooling} + }(2.23)\phantom{ \text{ SVP} + }(9.22)$$

$$- .7200 \text{ \%MININD} - .5476 \text{ Black} - .6763 \text{ Female}$$
$$(2.90)\phantom{ \text{ \%MININD} - }(4.18)\phantom{ \text{ Black} - }(5.41)$$

$$\bar{R}^2 = .421 \qquad SEE = .7659$$

Union membership continues to be worth almost $.70 an hour clearly labeling access to a unionized occupation as the surest admission ticket to higher earnings in this stratum, after controlling for human

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[19]The zero order correlations for %MINOCC and sex = .810
%BMOCC and race = .560

capital. SVP is significant once again, but use of the difference
in means test indicates that its coefficient in the final equation is
statistically lower than in the equation which contains only the human
capital variables. ($t'=2.16$)

All of these results are consistent with what we know about the
specific occupations within this OCC STRATUM. The Teamsters' and the
carpenters' union, for instance, have historically won wage packages
which are among the highest within the occupation spectrum. Workers
who gain access to these jobs or the other crafts gain from the
collective bargaining efforts of their unions; those who for one
reason or another do not enter these occupations will normally earn much
lower wages, ceteris paribus. This particularly affects the earnings
of women, but also limits the earning power of black men. The effect
of stratification, either in the form of "crowding" or pure discrimi-
nation, appears to reach its peak in this stratum. Again, however,
because of the high degree of segregation, it is statistically
impossible to differentiate between the two forms. Differences in
human capital--with the exception of SVP--only account for a small
fraction of the explained variance in earnings.

OCCUPATION STRATUM 12-14

For men, OCC STRATUM 12-14 primarily contains individuals who
are defined by the Census as "craftsmen, foremen, and kindred workers."
The largest specific occupation for white men if "foremen" (17.7%)
followed by "mechanics and repairmen, n.e.c." (14.5%) and "machinists"

(8.5%). "Linemen and servicemen," "plumbers and pipefitters," and "electricians" are also members of this group. For black men, the largest single group is "mechanics and repairmen, n.e.c." (19.5%) followed by "auto mechanics" (14.5%) and "foremen" (12.1%).

In contrast to both groups of men, most white women in this occupation group are found in white collar jobs; almost two-thirds (64.7%) are classified as "secretaries." Much smaller percentages are found as medical and dental technicians and department heads and buyers in retail outlets. The number of black women in this stratum is so small that no statistically significant results could be obtained.

The typical worker in this category had eleven years of schooling (10.8 years) and over 30 percent reported receiving some form of institutional training. White females had, on average, more schooling (11.4 years) but only 21 percent reported previous enrollment in a vocational education program. The average occupation in this stratum requires between two and four years of on-the-job training according to the SVP scale. A few jobs require more.

Consistent with the specific occupational composition of this stratum, a much smaller percentage of workers are trade union members (38.4%). Foremen have been discouraged from organizing into unions since Taft-Hartley and few secretaries and mechanics are members. Only about 4 percent of the stratum is black and only 15 percent are women reflecting the dominance of white men in these higher level occupations. Table 5.6 contains the regression results for this stratum.

TABLE 5.6

REGRESSION EQUATIONS:
OCCUPATION STRATUM 12-14 BY RACE AND SEX

	White Male		Black Male		White Female		Black Female		Cross Race-Sex	
Constant	-.2914	.2250	1.9477	1.9279	1.0390	-.0761	---	---	-2.9893	-.7516
HUMAN CAPITAL MODULE										
Schooling	.1593	.1244	.0719	.0545	.1152	.1068	SAMPLE SIZE		.1560	.1409
	(8.35)	(6.51)	(2.76)	(2.34)	(2.66)	(2.52)			(8.91)	(8.49)
School-South	-.0397	-.0385	---	---	---	---	TOO SMALL		-.0407	-.0370
	(4.58)	(4.64)	---	---	---	---	FOR		(5.15)	(5.00)
Training	---	---	.5840	.4125	---	---			---	---
	---	---	(2.65)	(2.14)	---	---	SIGNIFICANT		---	---
Migration	-.3327	-.2991	-.3493	-.3126	---	---	RESULTS		-.3148	-.2515
	(4.08)	(3.84)	(2.03)	(2.10)	---	---			(4.20)	(3.63)
Experience	.0097	.0070	---	---	---	.0166			.0101	.0084
	(2.55)	(1.89)	---	---	---	(2.16)	---	---	(2.81)	(2.55)
Specific Voc. Prep.	.2893	.2606	---	---	---	---	---	---	.6594	.2982
	(2.45)	(2.10)	---	---	---	---	---	---	(8.08)	(2.60)
STRATIFICATION MODULE										
Union Member	---	.3813	---	.4705	---	---	---	---	---	.3302
	---	(2.58)	---	(2.97)	---	---	---	---	---	(2.40)
% Minority--Industry	---	-.7850	---	-.8673	---	---	---	---	---	-1.0525
	---	(3.18)	---	(2.14)	---	---	---	---	---	(5.25)
% Minority--Occupation	---	---	---	---	---	---	---	---	---	-.4151
	---	---	---	---	---	---	---	---	---	(2.16)
% Black Male--Occupation	---	-8.0053	---	---	---	---	---	---	---	---
	---	(3.78)	---	---	---	---	---	---	---	---
% White Female--Occupation	---	---	---	---	---	---	---	---	---	---
% Black Female--Occupation	---	---	---	---	---	---	---	---	---	---
INDUSTRY MODULE										
Concentration	---	.9911	---	.8951	---	---	---	---	---	1.1334
	---	(5.56)	---	(3.24)	---	---	---	---	---	(7.03)
Union x Conc.	---	-.7066	---	---	---	---	---	---	---	-.7677
	---	(2.77)	---	---	---	---	---	---	---	(3.24)
After-tax Profit	---	---	---	---	---	18.6527	---	---	---	6.3150
	---	---	---	---	---	(4.61)	---	---	---	(3.05)
Capital/Labor Ratio	---	---	---	---	---	.0071	---	---	---	---
	---	---	---	---	---	(2.33)	---	---	---	---
Government Demand	---	---	---	---	---	---	---	---	---	---
WORKING CONDITIONS MODULE										
Physical Demands	---	---	---	---	---	---	---	---	---	---
Negative Work Traits	---	.1187	---	---	---	---	---	---	---	.1218
	---	(2.98)	---	---	---	---	---	---	---	(3.23)
R^2	.160	.252	.193	.424	.059	.277	---	---	.203	.336
SEE	1.0344	.9799	.9091	.7773	.8962	.7960	---	---	1.0530	.9654
MEAN	$3.50	$3.50	$2.59	$2.59	$2.36	$2.36	---	---	$3.29	$3.29
N	674	674	128	128	115	115	---	---	820	820

White Males - All of the human capital variables with the exception of institutional training are significant in the white male equation. An additional year of education is worth almost $.16 an hour; in the south almost $.12. Non-migrants earn $.33 less per hour while each additional year of labor force experience is valued at almost $.01. Apparently experience only begins to play a role in earnings functions in the relatively skilled occupations; within each of the lower level strata the wage-experience profile is flat. Finally each unit in the SVP scale adds $.29 to the hourly wage. Taken together these five factors explain 16 percent of the variance in earnings.

Even within this relatively high skilled occupation stratum, the stratification and industry modules are responsible for a large increase in the coefficient of determination. The $\bar{R}^2$ rises to .252 after these variables are entered. The differential in earnings due to industry segregation is almost $.25 an hour which is equivalent to a 7.3 percent wage differential. There is an additional $.32 or 9.7 percent differential due to the "crowding" of black men into certain occupations (%BMOCC).

Union membership and concentration each increase the wage rate as well, but again the interaction term is negative. Among generally competitive industries (MPF=.20), union membership adds $.24 to hourly earnings or 7.4 percent. Among concentrated industries, however, union membership apparently adds nothing extra to the wage rate. Above a concentration ratio of .54, in fact, the statistical

Concentration (MPF)

	20%	60%	
No union	$3.25	$3.65	+12.3%
Union	$3.49	$3.60	+ 3.2%
	+7.4%	-1.4%	+10.8%

relationship between unionization and earnings is slightly negative.[20]

In the unorganized sector oligopolies pay an average of 12.3 percent
more than do competitive industries. In the union sector a 40 point
differential in the market power factor is worth no more than an
additional 11 cents or 3.2 percent. Yet, overall, after we control for
human capital differences, a unionized highly concentrated industry
pays wages which are $.35 an hour or 10.8 percent greater than an
industry which is unorganized and competitive. The importance of the
industry and stratification variables thus prevails even among
relatively highly-skilled white men.

One other point might be added. In the complete equation, the
negative working traits factor in the working conditions module is

---

[20]The apparent negative effect of union membership on wage
rates in highly concentrated industries may, in fact, have some
substance to it. It seems plausible that non-union concentrated
industries may pay higher straight-time wages in order to ward off the
sympathetic pressure for unionization. The unionized industries on the
other hand may settle on a total economic and non-economic package
which realizes a lower straight-time rate, but makes up for it with
larger fringe benefits including longer vacations, more numerous
holidays, fully-paid medical insurance, life insurance, large pensions,
etc. In this case, unionization may mean lower straighttime wage rates
but higher total remuneration. The regression cannot measure this
effect.

significant and of the expected positive sign. The average occupation in this stratum for white men has approximately one (.93) negative trait with a standard deviation of nearly one (.98). After controlling for all other factors, a worker in an occupation with one extra negative trait earns $.12 more per hour in compensatory payments. What this appears to signify is that among relatively skilled (white male) workers, but not among the unskilled, wage rates respond to the "quality" of the job in a compensatory manner.

Black Males - An additional year of education is worth significantly less to a black male worker than to a white male in this stratum.[21] What is more, the rate of return on schooling is the lowest of any occupation group for black men reflecting both the higher opportunity costs of additional education and the near constant dollar value of schooling exhibited in each of the strata.[22] On the other hand, institutional training pays off handsomely, contributing $.58 an hour to the wage rate. This most likely represents the return to specific training in fields like auto mechanics. As usual migration is an important factor for black men, contributing here

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[21]The difference in means test yields a $t'=2.57$.

[22]The dollar values and the internal rates of return for a year of schooling for black men by occupation stratum are:

Occupation Stratum	Dollar Value	Internal R of R
1-3	$.0779	>2.0%
5	.0733	2.0
6-9	.0764	<2.0
12-14	.0719	<1.25
15-17	n.a.	n.a.

almost $.35 an hour. The value of migration is similar to that found
in OCC STRATUM 1-3 and 5 although below that in stratum 6-9.

Even within this relatively skilled group, the addition of the
STRAT and IND modules more than doubles the $\bar{R}^2$ to .424 and lowers the
SEE by $.13. Union membership is worth $.47 an hour and there is no
apparent negative interaction between unionization and concentration
as there is for white men. This may be due to the fact that on
average black workers in this stratum are found in much less concen-
trated industries. The mean MPF for white men is .46; that for black
men only .36. The regression, in this case, was not capable of
isolating the impact of concentration on the wage effect of union
membership for the few black workers in oligopolistic industries.
Translated into percentage terms, the $.47 wage increment due to union
affiliation is responsible for a 19.5 percent wage differential, a
rate more than twice as large as that for white men in the same stratum.
This adds to the mounting evidence that unionization while important
for white men is much more so for black males in every single stratum.
In this case, access to the organized skilled crafts is the port of
entry to higher earnings, human capital constant.

Industry segregation has an additional effect on relative
earnings. The $\pm 1\sigma$ evaluation of %MININD is valued at $.32 an hour.
In dollar terms, this is a bit larger than for any of the other strata.
In the industry module, the same evaluation of concentration is valued
at $.54, indicating that the few black men who do gain access to
oligopolistic industries benefit substantially. Here "complex"

crowding seems to prevail. If strictly additive, union membership, %MININD, and concentration would furnish a wage differential of $1.33, more than half the mean wage for this group. This is equivalent to wage rates of $1.93 vs. $3.26 an hour.

White Females - Before the introduction of the industry module, the only significant human capital variable is schooling. Each year is worth 11.5 cents an hour, higher than in any previous group. After the addition of the industry module years of experience in the labor force also appears as a significant factor in the earning generating function. Each year is valued at about 1.7 cents per hour which translates into a wage differential of $.33 between a woman who is 25 years of age and one who is 45.

None of the factors in the stratification module are significant including union membership; yet two of the industry or "demand" side variables are. According to theory there must be other factors beside unionization and minority segregation which serve to segment the labor force. Imperfections in job information and inter- and intra-labor market immobility due to geographical barriers may be factors sufficient to offset the tendency toward wage equalization as indicated by statistically significant variables in the industry module.

These results are understandable in light of this stratum's occupation composition. With 65 percent of the workforce as "secretaries," only 10 percent of the workforce unionized, and the mean percent of white females in an occupation greater than 70 percent, the

majority of the variance in earnings, after controlling for human

capital, is probably due to the pure institutional factor of "ability

to pay." Within the stratum, minority crowding and unionization are

not particularly important, but which industry a secretary has access

to apparently affects the wage. A secretary in an industry which has

a profit rate $\pm 1\sigma$ above the mean will earn, on average, \$.35 more per

hour. In an industry which has $\pm 1\sigma$ more capital per production worker

the average wage will be \$.17 higher.[23] The addition of just these

two variables is sufficient to more than quadruple the explained

variance and again suggests the tremendous importance of industry

attachment for minority members of the labor force.

Black Females - SAMPLE SIZE TOO SMALL FOR STATISTICALLY

SIGNIFICANT RESULTS.

Cross Race-Sex - As in occupation stratum 6-9, the individual

race-sex equations may underestimate the impact of crowding. This is

particularly true because of the nearly complete segregation of white

women in this stratum. The pooled regressions are therefore of value

in attempting to identify the true relationship between "crowding"

and earnings.

With the exception of institutional training, all of the factors

in the human capital module in the pooled regression are highly

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[23]It also seems plausible that "quasi-"sympathetic pressure may
work within an industry. White collar personnel in industries with
strongly unionized blue-collar workforces may benefit from the pro-
duction workers' union without belonging. In the present equation it
is possible that profits and capital-intensity are correlated with the
extent of blue collar unionism and consequently produce this phenomenon.

significant and explain about a fifth of the variance in earnings. Unlike the weak effect of schooling in the previous stratum, here a year of education is worth in excess of $.15 an hour. (In the south, an additional year of school is valued at 11.5 cents.) Migration adds over $.31 to average hourly earnings and each year of labor force experience adds another $.01 to the wage rate.

As expected, specific vocational preparation (SVP) is a potent factor in the earnings function reflecting the prime importance of apprenticeship in the skilled trades. At the same time, the <u>absence</u> of this factor in the equations for black men and white women and its weaker presence in the white male equation exposes the nature of the link between demographic characteristics and access to occupations which offer apprenticeship. The link runs first from race and sex to occupation and then from occupation to specific training. Access to a job with an SVP rating one unit higher than the mean is worth nearly $.66 an hour. The addition of the stratification, industry, and working conditions modules reduces the coefficient on SVP by more than half and the further addition of the dummy for sex eliminates SVP altogether. Once again we have allowed this to occur because of the presumed causal relationship involved in the function.

The final complete equation including variables for race and sex is shown in Equation (IV).

(IV)

$$w = 1.7244 + .1264 \text{ Schooling} - .0354 \text{ School-South} - .2601 \text{ Migration}$$
$$ (7.52) \phantom{\text{ Schooling} - } (4.89) \phantom{\text{ School-South} - } (3.84)$$

$$+ .0088 \text{ Experience} + .3991 \text{ Union} - .8550 \text{ \%MININD}$$
$$ (2.66) \phantom{\text{ Experience} + } (2.98) \phantom{\text{ Union} - } (4.29)$$

$$- 7.3783 \text{ \%BMOCC} + .9492 \text{ Concentration} - .8240 \text{ Union-Conc.}$$
$$ (4.55) \phantom{\text{ \%BMOCC} + } (6.10) \phantom{\text{ Concentration} - } (3.60)$$

$$+ 5.5602 \text{ After-tax Profit} + .1304 \text{ Negative Work Traits}$$
$$ (2.78) \phantom{\text{ After-tax Profit} + } (3.59)$$

$$- .8806 \text{ Sex}$$
$$ (8.28) R^2 = .370 SEE = .9411$$

Except for SVP, the integrity of the original human capital equation is preserved.

The dummy variable for race is insignificant after controlling for %MININD and black male employment (%BMOCC). While there may still be some pure racial discrimination <u>within</u> industries, occupation, and specific firms, the dominant stratification effect appears to be related more directly to industrial and occupational crowding. Moreover the crowding hypothesis is supported by evidence that the inclusion of the sex variable has only a minor deteriorating effect on the coefficient on %MININD and none on %BMOCC. Without the dummy variable, the $\pm 1\sigma$ evaluations of these two factors are wroth $.37 and $.23 respectively. After the dummy is added, the value on %MININD falls by only 7 cents and the coefficient on %BMOCC actually rises by $.11. Thus pure sex discrimination exists simultaneously with crowding leaving the average female $.88 an hour worse off.

On the demand side, union membership and concentration interact in an almost identical fashion in the pooled regression as in the white male equation. Among unorganized workers, a forty point difference in the concentration ratio is responsible for a 12 percent difference in average hourly earnings. In competitive industries, union membership is worth about $.23 or 7.4 percent; in concentrated industries, unionization adds nothing to the wage rate. All in all there exists a 9.0 percent wage differential between similarly skilled workers in unionized concentrated and unorganized competitive industries.

	Concentration (MPF)		
	20%	60%	
No union	$3.10	$3.48	+12.25%
Union	3.33	3.38	+ 1.50%
	+7.4%	-2.9%	+ 9.0%

Higher after-tax profits also affect earnings in this stratum independent of unionization and concentration. The average wage rate in an industry with after-tax profits $\pm 1\sigma$ higher than the mean is $.10 greater than for workers in the "average" industry. As in the white male equation, negative work traits is also significant and of the expected positive sign, indicating again that at least at this higher skill level, compensatory wage payments are necessary to induce a sufficient supply of labor to the more "distasteful" jobs.

What we find most interesting about these results is that they show that even among relatively well-educated and skilled workers,

large wage differentials can be traced to factors other than differences in human capital and working conditions. This begins to disappear only among the very most educated and skilled workers, those in occupation stratum 15-17.

OCCUPATION STRATUM 15-17

Unfortunately the number of blacks in the SEO's highest skilled occupation stratum is too small to allow individual statistical analysis. Consequently the results refer only to the white population except for the pooled race-sex equations.

White men are found in a plethora of specific professional and managerial occupations within this stratum. The largest numbers are found as accountants, insurance agents, draftsmen, and secondary school teachers. Others are found as pharmacists and engineers. In contrast over 68 percent of white women in this group are employed in just three occupations: as primary school teachers, high school teachers, and professional nurses.

The white males in the sample average over 14 years of schooling and nearly 45 percent have had some form of institutional training beyond their formal education. Very few (11%) are members of trade unions and the average minority employment in their occupations is only 10.8 percent. The white females in this stratum have slightly less education (13.0 years) and only one-fifth have had any vocational training outside of formal schooling. Union membership is weak for women as it is for men (10%) but the average minority

employment in their occupations is three times the male rate (34%).

Of total minority employment in this stratum over 90 percent are white

women suggesting again the extremely small proportion of blacks in

these occupations. Table 5.7 presents the regression results.

White Males - Among professionals and other highly skilled

personnel, formal education becomes the primary variable explaining

wage differentials. For white men, each year of education is worth

more than twice its value in any of the lesser skilled strata. An

additional year of schooling is worth $.33 an hour and there is no

differential associated with where the schooling was taken. Only in

this highest skilled stratum is there no discount for southern

education. The importance of formal schooling is, of course, fully

consistent with the type of training usually required for these pro-

fessional occupations.

Migration also plays a role. A $.48 wage differential exists

between migrants and those who have never moved from the area in which

they lived at age 16. On a full-time full-year basis, this is equivalent

to almost a $1000 annual salary differential. Years of experience is

also especially important adding more than $.03 to hourly earnings per

year of labor force participation. Each year of experience translates

into an annual $60 salary premium. Finally specific vocational

preparation adds nearly $.70 per SVP unit to the hourly wage. Altogether

the human capital module explains about a quarter of the variance.

The addition of other modules to the equation does not

appreciably improve the fit. The only significant variable is after-tax

TABLE 5.7

REGRESSION EQUATIONS:
OCCUPATION STRATUM 15-17 BY RACE AND SEX

	White Male		Black Male		White Female		Black Female		Cross Race-Sex	
Constant	-5.3929	-6.3036	---	---	-.5661	-1.3813	---	---	-4.7987	-4.6604
HUMAN CAPITAL MODULE										
Schooling	.3253	.3192	SAMPLE TOO		.2620	.2853	SAMPLE TOO		.3513	.3196
	(7.26)	(7.21)			(3.59)	(4.13)			(8.34)	(7.79)
School-South	---	---	SMALL FOR		---	---	SMALL FOR		---	---
Training	---	---	SIGNIFICANT		---	---	SIGNIFICANT		---	---
Migration	-.4793	-.4123*	RESULTS		---	---	RESULTS		-.4913	-.4622
	(2.01)	(1.84)			---	---			(2.20)	(2.14)
Experience	.0318	.0351	---	---	---	---	---	---	.0279	.0320
	(3.04)	(3.37)	---	---	---	---	---	---	(2.79)	(3.30)
Specific Voc. Prep.	.6707	.6934	---	---	---	---	---	---	.5322	.4544
	(2.56)	(2.68)	---	---	---	---	---	---	(2.18)	(1.96)
STRATIFICATION MODULE										
Union Member	---	---	---	---	---	---	---	---	---	---
% Minority--Industry	---	---	---	---	---	---	---	---	---	---
% Minority--Occupation	---	---	---	---	---	---	---	---	---	---
% Black Male--Occupation	---	---	---	---	---	---	---	---	---	---
% White Female--Occupation	---	---	---	---	---	---	---	---	---	-2.4717[a]
	---	---	---	---	---	---	---	---	---	(3.82)
% Black Female--Occupation	---	---	---	---	---	---	---	---	---	---
INDUSTRY MODULE										
Concentration	---	---	---	---	---	1.2463	---	---	---	.7297
	---	---	---	---	---	(2.22)	---	---	---	(2.13)
Union x Conc.	---	---	---	---	---	---	---	---	---	---
After-tax Profit	---	15.5935	---	---	---	---	---	---	---	14.6214
	---	(2.73)	---	---	---	---	---	---	---	(2.80)
Capital/Labor Ratio	---	---	---	---	---	---	---	---	---	---
Government Demand	---	---	---	---	---	---	---	---	---	---
WORKING CONDITIONS MODULE										
Physical Demands	---	---	---	---	---	---	---	---	---	---
Negative Work Traits	---	---	---	---	---	---	---	---	---	---
R^2	.247	.267	---	---	.316	.422	---	---	.254	.315
SEE	1.7809	1.7608	---	---	.8954	.8385	---	---	1.7765	1.7110
MEAN	$4.83	$4.83	---	---	$2.83	$2.83	---	---	$4.63	$4.63
N	287	287	---	---	30	30	---	---	322	322

[a] Percent Female-Occupation

profits; the $\pm 1\sigma$ evaluation is worth \$.58 or 12 percent of the mean

wage for this group. The addition of this factor increases the $\bar{R}^2$

by merely .02 and reduces the SEE by only 2 cents. For all intents

and purposes stratification is not particularly responsible for the

variance in earnings among white male professionals. It is _only_ among

this special group that the (relatively) pure human capital hypothesis

holds.

White Females – The sample of white females is quite small, but

some of the variance in earnings can be explained. In this case,

however, only education is significant in the human capital module

and this factor alone is responsible for 32 percent of the variance in

earnings. Each year of formal schooling is worth at least \$.26 an

hour which translates into a sizable 9 percent rate of return based

on the method used throughout this analysis. This high rate of return

is no doubt due to the effect of advanced degrees opening up access

to occupations beyond teaching and nursing. Migration, experience,

and SVP do not appear to explain any of the wage differential within

this high skill strata of women.

The inclusion of the industry module adds considerably to the

explanation of earnings. The only significant factor is concentration,

but this variable alone raises the coefficient of determination to .422

and reduces the SEE from \$.8954 to \$.8385. The $\pm 1\sigma$ evaluation of the

market power factor is valued at \$.70 per hour which is equivalent

to almost 25 percent of the mean wage for this group. Thus, while the

pure human capital model seems to account for the overwhelming majority

of explained variance among high skilled white men, other factors still play a significant role in explaining the earnings of white female professionals.

Cross Race-Sex - The cross race-sex equations contain a small number of black men and women as well as whites. The human capital module results are similar to those for white men, but in addition variables in both the stratification and industry modules are significant.

The human capital module contains schooling, migration, experience, and SVP. Each of these factors has a regression coefficient similar to those in the white male equation. In addition, before adding the race and sex dummies, the percent of female employment in an occupation (%FMOCC) is highly significant and the $\pm 1\sigma$ test has a value of $.76 an hour. In the industry module both concentration and after-tax profits are significant variables with the $\pm 1\sigma$ evaluation worth $.42 and $.54 respectively. The inclusion of these three variables raises the $\bar{R}^2$ from .254 to .315 and reduces the SEE from $1.7765 to $1.7110.

When race and sex are added, only the dummy variable for sex is significant probably because of the very small number of blacks in the subgroup sample. Equation (V) gives these final results.

(V)

$$w = -4.9651 + .3120 \text{ Schooling} - .4037 \text{ Migration} + .0335 \text{ Experience}$$
$$(7.72) \qquad (1.90) \qquad (3.53)$$

$$+ .5524 \text{ SVP} - 1.4339 \text{ \%FMOCC} + 15.3525 \text{ After-tax Profit}$$
$$(2.34) \qquad (2.05) \qquad (2.99)$$

$$- 1.3944 \text{ Sex}$$
$$(3.98) \qquad\qquad \bar{R}^2 = .338 \qquad SEE = 1.6814$$

The coefficients on the human capital variables do not appreciably change after the addition of the dummy variable to the equation, but the coefficient on %FMOCC falls from -2.47 to -1.43 and concentration becomes insignificant. There is obviously a large wage differential associated with sex _per se_, yet the "crowding" factor still remains significant as does after-tax profits. Given racial and sexual differences in the labor force, stratification by occupation and industry plays some role in wage determination even at the top of the occupational hierarchy.

Again, further analysis of the regression results for individual occupation strata will be postponed until the next chapter.

CROSS OCCUPATION STRATA

The evidence presented up to this point indicates that _within_ broad occupation groups, stratification and industry variables contribute to an explanation of existing wage differentials. In all cases these variables are of the proper sign, usually of large magnitude, and have relatively high t-values. Except in the case of the white male equation in OCC STRATUM 15-17, the addition of the non-human capital modules significantly boosts the coefficients of determination and reduces the standard errors of estimate. We can conclude that within most occupation strata, the general model of wage determination posited here is superior to any developed in the tradition of pure human capital or, for that matter, pure institutional theory.

But the more severe test of the relative merits of human capital, institutional, and stratification theory requires evidence across occupational strata. As we have mentioned, it can well be argued that the findings within strata do not ultimately test the theory since individuals invest in human capital ostensibly to move from one stratum to another. Testing the human capital theory within a single stratum is therefore biased in favor of the institutional and stratification hypotheses. This bias is eliminated by pooling the sample across occupation strata. The full impact of the human capital module can then be measured. Table 5.8 provides these regression results.

White Males - For the full-time white male workforce in the 1967 SEO sample, earnings averaged $3.42 an hour with a standard deviation of $1.60. Based on either a simple $\bar{R}^2$ test or based on the change in the standard error of the estimate, little additional variance appears to be explained by variables other than human capital factors. The complete equation including stratification, industry, and working condition components increases the $\bar{R}^2$ by only .033 and reduces the SEE only slightly.

Each of the human capital factors is statistically significant for white men with the exception of the vocational training variable. Each year of education is worth $.20 in hourly earnings if the schooling was taken outside of the south. Southern education is valued at two cents less reflecting only a slight regional differential in the returns to schooling for the white male workforce as a whole. According to the rate of return methodology used throughout this study,

TABLE 5.8

REGRESSION EQUATIONS:
ALL OCCUPATION STRATA BY RACE AND SEX

	White Male		Black Male		White Female		Black Female		Cross Race-Sex	
Constant	.1911	.3353	1.5519	1.0838	1.5963	1.6647	.9224	1.7209	.3113	1.0962
HUMAN CAPITAL MODULE										
Schooling	.2030	.1767	.0911	.0721	.0578	.0429	.0905	.0749	.1526	.1405
	(15.62)	(12.99)	(8.93)	(8.05)	(3.66)	(2.95)	(7.13)	(7.64)	(13.63)	(12.66)
School-South	-.0199	-.0160	-.0471	-.0315	-.0249	-.0182	.0311	-.0215	-.0260	-.0186
	(2.93)	(2.37)	(7.48)	(5.73)	(3.83)	(2.91)	(5.02)	(3.77)	(4.58)	(3.44)
Training	---	---	.2442	.2059	---	---	---	---	.2315	.1620
	---	---	(2.89)	(2.83)	---	---	---	---	(3.17)	(2.35)
Migration	-.2884	-.2861	-.3745	-.2738	---	---	-.2230	-.1634	-.3343	-.3037
	(4.24)	(4.28)	(6.72)	(5.65)	---	---	(3.66)	(2.94)	(6.01)	(5.83)
Experience	.0123	.0119	.0065	.0062	-.0095	---	---	---	.0059	.0065
	(3.97)	(3.90)	(2.41)	(2.03)	(2.89)	---	---	---	(2.19)	(2.50)
Specific Voc. Prep.	.1596	.1541	.0641	.0883	.0478	.0570	.0365*	.0468	.2076	.1222
	(8.67)	(8.42)	(3.93)	(6.22)	(2.00)	(2.37)	(1.66)	(2.35)	(13.22)	(6.79)
STRATIFICATION MODULE										
Union Member	---	.2460	---	.5452	---	.2814	---	.2850	---	.3760
	---	(2.00)	---	(10.46)	---	(3.88)	---	(4.97)	---	(3.90)
% Minority--Industry	---	-.5306	---	-.6746	---	-.5370	---	-1.0994	---	-1.0032
	---	(2.47)	---	(4.23)	---	(3.00)	---	(6.59)	---	(6.31)
% Minority--Occupation	---	---	---	---	---	---	---	---	---	-.9075
	---	---	---	---	---	---	---	---	---	(6.53)
% Black Male--Occupation	---	---	---	---	---	---	---	---	---	---
% White Female--Occupation	---	---	---	---	---	---	---	---	---	---
% Black Female--Occupation	---	---	---	---	---	---	---	---	---	---
INDUSTRY MODULE										
Concentration	---	.8599	---	---	---	---	---	.3171	---	.7196
	---	(5.61)	---	---	---	---	---	(2.64)	---	(5.38)
Union x Conc.	---	-.5671	---	---	---	---	---	---	---	-.6471
	---	(2.49)	---	---	---	---	---	---	---	(3.53)
After-tax Profit	---	6.3688	---	8.2545	---	5.9787	---	---	---	6.5506
	---	(3.26)	---	(5.76)	---	(2.96)	---	---	---	(3.82)
Capital/Labor Ratio	---	---	---	.0023	---	.0027	---	---	---	.0010
	---	---	---	(3.90)	---	(3.02)	---	---	---	(2.00)
Government Demand	---	---	---	1.0711	---	2.2590	---	---	---	.9123
	---	---	---	(3.99)	---	(2.90)	---	---	---	(2.22)
WORKING CONDITIONS MODULE										
Physical Demands	---	-.1340	---	---	---	-.2323	---	-.1436	---	-.1263
	---	(3.16)	---	---	---	(4.79)	---	(3.27)	---	(3.26)
Negative Work Traits	---	---	---	---	---	---	---	---	---	---
R²	.223	.256	.207	.421	.048	.155	.291	.431	.238	.333
SEE	1.4142	1.3862	.8117	.6953	.9659	.9136	.5644	.5074	1.3270	1.2439
MEAN	$3.42	$3.42	$2.37	$2.37	$2.05	$2.05	$1.66	$1.66	$2.96	$2.96
N	1850	1850	912	912	932	932	397	397	2394	2394

the average white male worker reaps a 5-1/2 percent return by

remaining in school for an additional year (at the mean). This clearly

exceeds the rate of return earned by each of the minority groups in

the labor force; it is double the rate for black men and more than four

times the rate earned by white women.[24] At least in relative terms,

additional education is a good investment for white men, a finding

consistent with virtually all human capital studies.

Migration, experience, and on-the-job training also play important

parts in the wage determination process. Non-migrants earn, on average,

$.29 less per hour than those who have moved at least fifty miles

from their place of residence at age 16. This is equivalent to

almost $600 per year for a full-time worker. Each year of labor force

experience adds another 1.23 cents an hour to the wage rate. In

annual terms this implies a $246 differential between the earnings

of a fifteen year labor force veteran and a worker who has been out

of school for only five years. Finally each unit of specific

vocational preparation is worth $.16 per hour. Given the full range

of this variable, there is a $1.44 difference in earnings between a

worker in an occupation which requires only a short demonstration

period and a worker whose occupation requires at least 10 years of on-

the-job apprenticeship. On an annual basis the impact of SVP has a

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[24]The actual figures for the four race-sex groups are: white
men 5.5%, black men 2.75%, white women 1.25%, and black women 4.75%.
These relative rates of return are consistent with apriori theory and
are further explored in the text.

range of $2,880.[25]

While the other exogenous factor modules add only slightly to an explanation of the variance, six of the variables in these modules are statistically significant. Union membership and concentration interact in the now familiar manner.

	Concentration (MPF)		
	20%	60%	
No union	$3.24	$3.59	+10.8%
Union	3.37	3.49	+ 3.6%
	+4.0%	−2.8%	+ 7.7%

These results indicate that union membership has only a marginal impact on relative wages in both competitive and concentrated industries, a conclusion departing from many institutional analyses and roughly consistent with Weiss's results. In a similar regression, Weiss found that unionization increased earnings by at most 6–8 percent for a comparable group of workers.[26]

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[25]One example will serve to indicate the magnitude of the potential wage differential based on these regression results. A white male high school drop-out with ten years of schooling who never migrated, has worked in the labor force for five years and is presently employed in an occupation which requires only a short demonstration to learn its basic skills will earn, on average, $2.15 an hour. Alternatively, a college graduate who has migrated, has 15 years of labor force experience and is presently in a job requiring between one and two years of on-the-job training will earn $4.58 per hour. This is equal to a $2.43 wage differential, the college graduate earning 113 percent more than the high school drop-out.

[26]Weiss, op. cit., p. 108.

Concentration is more important in the present analysis. Weiss found a forty point increase in concentration increased earnings by only 3-5 percent. Here we find the increase to be as large as 10.8 percent in the non-union sector. Again we attribute our finding to the better measure of concentration used in the present analysis. The weaker effect of concentration on earnings among organized workers implies that unions in the competitive industries have the ability to win wage contracts more in line with the pattern set in the oligopolistic sector while unorganized workers in the competitive sector do not have this opportunity.[27] Overall, a unionized worker in a concentrated industry earns 7.7 percent more than a similarly skilled non-union worker in the classically competitive sector of the economy.

Two other variables in the stratification and industry modules affect white male earnings. A ±1σ difference in %MININD is valued at $.16 an hour while a similar ±1σ evaluation of after-tax profits implies a $.22 differential. In both cases the effect is statistically significant, but relatively minor being only 4.6 percent and 6.4 percent of the mean wage. In addition to these variables, the physical demands factor has a significant negative sign. Heavier work apparently earns

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[27]The implication we draw from these results is thus at variance with the overall conclusions of Weiss. He writes, "The implication seems to be that firms in concentrated industries do pay their employees more, but that they get higher 'quality' labor in the bargain. The incomes won by unions for their members more clearly exceed what those workers would earn in their best alternative employments." To the extent that it is possible to differentiate between the effect of concentration and unionization, the present study appears to indicate that monopoly rents arise more from the product market structure of an industry than from the present of unionization. Weiss, p. 108.

a lower wage after controlling for human capital characteristics and industry attachment. The coefficient on negative work traits is not significantly different from zero. In neither case is there an indication of a compensatory earnings effect.

Black Males – The regression results for black males are in sharp contrast to those we have just seen. The human capital module is responsible for less than half of the total explained variance in earnings with the addition of the stratification and industry factors reducing the standard error of the estimate considerably. The essential structure of the earnings generating functions have a significant racial component, as we shall see.

Every human capital factor in the black regression is significant. Schooling taken outside of the south adds $.09 per hour for every year completed. This is less than half of the increment afforded to comparable whites and amounts to a rate of return of less than 3 percent at the mean.[28] This low hourly increment and the low return are consistent with virtually all of the studies that have been made of the impact of formal schooling on black male earnings.[29] What is more, southern schooling is worth only half as much as schooling taken elsewhere, presumably reflecting the poorer quality of southern black

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[28]The difference in the coefficient on schooling between the white male and black male equation is significant at considerably better than the .01 level according to the difference in means test. t'=6.77.

[29]See Hanoch, op. cit. and Bennett Harrison, op. cit. for two important studies in this regard.

schools. The discount for southern schooling is much greater for black than for white men suggesting that the quality difference in education between southern schools and all others may be primarily race-related. In the non-south, the relative dollar return to schooling between black and white men is (.0911/.2030)=.45. In the south, the equivalent ratio is .24.

Vocational training is also a significant factor in the black male earnings equation. This is the only group for which this is true implying that although institutional manpower programs do not appreciably affect the earnings of most workers, they do benefit black men. Enrollment in a training program is valued at $.24 an hour or somewhat in excess of 10 percent of the mean wage. Whether these programs actually increase "endogenous" productivity cannot be directly measured, of course. What the significant coefficient suggests may only be that black workers who have completed a training program are more likely to be hired for jobs that pay somewhat higher wages.

Migration is another powerful factor influencing wages for this group. For the black male workforce as a whole, migration is worth an average of $.37 an hour. No doubt much of this overall increment reflects the special beneficial effect of moving out of the south. The high rate of return attendent to southern emigration is most likely responsible for explaining the higher coefficient on "migration" compared to the parameter in the white male equation. Outside of the south, migration may fail to pay off as handsomely for blacks as

it does for whites.[30]

Labor force experience increments earnings by $.0065 an hour
per year. Each year in the labor force is consequently worth only
about half the rate for white men implying a much flatter age-earnings
profile. Finally each unit of on-the-job training (SVP) is worth
$.06 an hour. This figure too is less than half the coefficient for
white men. Part of this difference may be the result of unspecified
non-linearities in the return to specific vocational preparation.
Alternatively, the smaller coefficient indicates a real difference
in the return to each unit of SVP.

Taken together the six human capital factors explain one-fifth
of the variance in earnings among full-time black male workers. The
addition of the three remaining modules increases the coefficient of
determination to .421. Union membership is extremely powerful in the
complete equation. The nearly $.55 wage differential between union
and non-union workers represents an average union wage which is 25.7
percent greater than that received by the average non-union worker.
Obviously exclusion from a trade union has a massive impact on the

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[30]Evidence for this statement can be found in Barry Bluestone,
William Murphy, and Mary Stevenson, Low Wages and the Working Poor
(Ann Arbor: Institute of Labor and Industrial Relations, University of
Michigan-Wayne State University, 1973), p. 127. Regarding black males,

"Mobility out of other regions of the nation (other than the
south) does not pay as handsomely. Across all education
groups, moving out of the Northeast is only slightly bene-
ficial for those who move to the North Central states or to
the West. All other moves actually increase the probability
of poor paying jobs."

earnings of a black male worker. While not a particularly important factor for white men, unionization represents a most important route to higher pay for the black male workforce. This is consistent with both institutional and stratification hypotheses. The percent of minority employment in an industry (%MININD) also affects the earnings distribution for this group of workers. A ±1σ difference in %MININD is valued at $.22 an hour, just slightly higher than the effect on white male earnings.

The industry module in the final equation has a structure which is basically different from that of white men. Neither concentration nor the interaction term are reported in the final equation, although in test runs concentration (but not the interaction term) was extremely significant and powerful. It was necessary to drop concentration from the final equation because its addition always destroyed the integrity of one of the human capital factors. All of the regressions which were prepared with concentration as one of the exogenous variables failed to include "experience" as a statistically significant human capital factor. It was impossible to pin down the reason for this deteriorating effect on the "experience" coefficient.

As a substitute for concentration, other industry variables were significant in the complete equation without harming the human capital module coefficients. These included the highly colinear after-tax profit rate. The ±1σ evaluation of this variable is worth $.32 an hour. Similar ±1σ evaluations of the capital/labor ratio and the government expenditure variables are worth $.18 and $.20

respectively.[31] Each of these effects taken independently have more than a minor impact on the distribution of earnings. To the extent that these effects are additive, the industry module is quite powerful. The case for "complex" crowding is convincing while the human capital explanation leaves much to be desired.

The actual importance of human capital in explaining the existing wage differential between white and black men can be quantified by using the information generated in the regressions. The average wage for black male workers in 1967 was $2.37 or 69 percent of the average white male rate. The standard deviation was $.91.[32]

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[31]These three industry factors make perfect "quasi-"instrumental variables. They are colinear with concentration but not with variables in the human capital module. The partial (X^tX) matrix for the relevant factors is reproduced below.

Partial (X^tX) Matrix for Black Males
Cross Occupation Equation

	Concentration	Schooling	Experience
After-tax Profit	.5470	.1464	-.0797
K/L Ratio	.3706	-.0614	.0758
Government Demand	.1352	.0383	.0069

[32]Variability in earnings in the sample white male population is considerably greater than in the black male group. The coefficient of variation (V) for whites is .4678 while only .3838 for the black male sample. Two factors might explain this difference. One is that the underlying black male population is more homogeneous in human capital and therefore more homogeneous in earnings. The other is that the labor market treats black men as though they were more homogeneous in human capital than they really are (i.e. employers disregard human capital differences or discount them). In the first case we would expect to find a greater V for the human capital characteristics of

If we substitute the black means into the white equation the hourly

rate for black males rises to $2.58 or 75 percent of the white male

mean. Furthermore if we substitute black male means for the human

capital module, but white male means for the other modules, the black

male wage rate increases to $2.73 or 80 percent of the WM average.

Assuming that SVP is a stratification variable because it is acquired

on the job after access to employment has been secured, the black male

wage now rises to $2.97 an hour or 87 percent of the white male mean.

In this certainly plausible case, factors other than human capital

account for over 56 percent of the BM/WM differential and only 43

percent of the mean wage difference between white and black males is

the white male group.

Empirically we find the opposite to be true. For each of the
human capital variables with the exception of School-south, the V's
for white and black men are generally equal or the coefficient is
greater for black men.

	V_{wm}	V_{bm}	V_{wm}/V_{bm}
Earnings	.4678	.3838	1.2188
Schooling	.2773	.4011	.6913
School-South	1.7467	.8080	2.1617
Training	1.6995	2.5823	.6581
Migration	1.2046	1.1601	1.0383
Experience	.4344	.4220	1.0293
SVP	.3610	.4582	.7878

This implies that the labor market is less sensitive to differences in
the endogenous productivity characteristics of the black male workforce.
Larger relative variability in education, for instance, is not
reflected in the variability in earnings. This does not necessarily
imply that individual employers who hire blacks totally overlook differ-
ences in worker characteristics when choosing their employees. But it
does provide another cogent piece of evidence that the labor market
facing black workers is substantially restricted.

due to measured differences in causally prior human capital variables.[33]

These results are summarized in Table 5.9.

TABLE 5.9

POTENTIAL WAGE RATES FOR BLACK MALE WORKERS UNDER
VARYING ASSUMPTIONS ABOUT THEIR CHARACTERISTICS

Assumptions	$(WM\frac{}{wm}=\$3.42)$ Wage	BM/WM Ratio
$BM\frac{}{bm}$HC,Strat, Ind, WC	\$2.37	.69
$WM\frac{}{bm}$HC, Strat, Ind, WC	2.58	.75
$\frac{bm}{}$HC $WM\frac{}{wm}$Strat, Ind, WC	2.73	.80
$\frac{bm}{}$HC(-SVP) $WM\frac{}{wm}$Strat, Ind, WC, SVP	2.97	.87

BM = Black male estimating equation
WM = White male estimating equation
$\overline{bm}$ = mean values for BM exogenous variables
$\overline{wm}$ = mean values for WM exogenous variables

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[33]The differential due to measured human capital factors is calculated from:

$$D_{HC} = \frac{WM\frac{}{wm} - WM\frac{}{wm}\frac{\overline{bm}HC(-SVP)}{Strat, \ Ind, \ WC, \ SVP}}{WM\frac{}{wm} - BM\frac{}{bm}}$$

White Females - The overall structure of the complete white
female equation is somewhat similar to that for the black male
workforce with two important exceptions. The first is that neither
the human capital regression nor the complete equation are very good
models of wage determination based on the coefficient of determination
or the standard error of the estimate. The second exception is that
the human capital equation contains neither training nor migration, both
of which were significant variables in the black male regression. In
addition the sign on the experience variable is negative.

The unaugmented human capital equation explains only 4.8 percent
of the variance in white female earnings and each of the exogenous
variables is relatively weak. A year of schooling in the non-south is
worth less than $.06 an hour at the mean while a year of southern
schooling is worth only $.03. In the non-south this is equivalent
to a minuscule 1.25 percent rate of return on a year of education, the
lowest for any race-sex group. Based on this evidence, schooling does
not generally appear to be a very profitable investment for white
women in terms of their own future earnings. Vocational training is
not very profitable either. Although almost 11 percent of the sample
had some form of institutional training, enrollment in such programs
does not have a significant impact on earnings. As we have mentioned
previously, according to our regressions, only black men earn more due
to manpower programs. Migration plays no role either. This was not
unexpected given the assumption that men migrate for economic reasons
while working women generally follow their husbands rather than seek

to maximize own earnings through geographical relocation.

When running the human capital variables alone, a negative sign is found on the experience variable implying that more experienced women earn _less_ given equal years of schooling. As we noted earlier, this result may be illusory because of measurement error. Given the pattern of female labor force participation the "experience" variable does not accurately measure the number of years in the labor force. However if human capital "depreciates" with non-participation, it can be expected that a woman who returns to the labor market after a period of time out of the labor force will earn less than a woman who never left work. This could explain a flat or negative earnings profile with respect to the variable "experience" or, to be more accurate, age. In the complete equation, the coefficient on "experience" is not significantly different from zero indicating a flat "experience"-earnings profile after controlling for all other measured factors.

Specific vocational preparation is barely significant at the .05 level. Each unit of SVP adds less than five cents to earnings, an amount smaller than a third of that in the white male equation. Again the relative size of the female coefficient may be biased downward because of non-linearity in the variable. But this seems unlikely to explain such a large difference.[34]

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[34]Alternatively, the weaker earnings effect of on-the-job training found in the white female equation may reflect a significant interaction between this variable and other human capital factors. It can be hypothesized that each additional unit of SVP _in combination_ with education or other human capital factors has a higher rate of

The addition of the three remaining modules increases the $\bar{R}^2$ to .155 and reduces the SEE by $.06. As in the black male equation, inclusion of concentration only came at the expense of violating the proviso concerning the human capital module. Coefficients on both schooling and SVP fell significantly when concentration was added to the equation. Consequently other industry variables were used as quasi-instruments.

Both union membership and %MININD were significant in this equation. Union membership is valued at $.28 an hour leaving organized workers earning 14.2 percent more than non-union employees. The dollar amount is approximately equal to that of white male workers but only about half that of black men. In addition the $\pm 1\sigma$ evaluation of %MININD has a value of $.22 an hour around a mean of $2.05. As in the black male equation, after-tax profits, the capital/labor ratio, and the government expenditures variable are all significant.

<u>$\pm 1\sigma$ Evaluations</u>

After-tax profit rate	$.20
Capital/labor ratio	.19
<u>Government demand</u>	<u>.18</u>
"Additive" Total	$.57

return. Without some form of complementary investment, SVP alone is worth little.

Given the lower mean SVP for white women ($\overline{SVP}_{wm}$=5.28 vs. $\overline{SVP}_{wf}$=4.16) this could explain the difference in the coefficients. To test this we ran an interaction term including GED and SVP and another with schooling and SVP. Both variables were insignificant. The lower coefficient in the white female equation apparently either represents the effect of specification error or implies a significantly lower return to on-the-job training. The coefficients on SVP for the white male and white female equations are significantly different at better than the .01 level. (t'=3.96)

Finally the physical demands factor is significant, but once again negative. Physically demanding work is rewarded with lower wages, other things equal.

Compared with the other race-sex groups, relatively less of the variance in white female earnings is explained by the general model of wage determination. The use of interaction terms in the human capital module might have improved the fit, but experimentation with these variables proved fruitless. Apparently there are numerous other factors not taken into account in the model which have special relevance for white women.[35]

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[35]Conjecture leads us to believe that one set of factors determining earnings not taken into account in the general model relates to the importance of earnings for women in various types of households. Ceteris paribus, a woman's earnings may be inversely related to her family's ability to provide a sufficient income to keep the family at a "satisfactory" or target standard of living. Where the woman's earnings are an important portion of the family's total income, we might expect more intensive job search by the female in the household with earnings being the key argument in her utility function. Earnings may be a much less crucial factor in job choice in families with sufficient income from other household members or alternative sources. In this case, two women with equal endogenous productivities may earn significantly different wages.

Another set of factors that may be important in the earnings function for white women has to do with physical appearance and the production of "psychological" benefits to employers. According to Paddy Quick, women may be hired for other reasons than objectively measured productivity; they supply their bosses (and their customers) with a more or less pleasant social and psychological environment. The human capital characteristics measured in the present study may not capture the traits which are "productive" in this respect. With these factors missing, the general model fails to account for a large part of the variance in white female earnings. See Paddy Quick, "Women's Work," Review of Radical Political Economics, Vol. 4, No. 3, July 1972.

Although our equations leave a good deal of the variance in earnings unexplained, we can still estimate the impact of the human capital module on the wage differential between white women and men. This can be done as in the black male equation by varying assumptions about the mean values of the white female exogenous variables. The results indicate that human capital is an extremely inadequate explanation of the forty percent wage gap between white men and women.

Plugging all of the white female means into the earnings equation for white men increases the WF/WM ratio from .60 to .90. If we use the white male means in the stratification, industry, and working conditions modules and the white female human capital means, the ratio rises to .93. Finally if we assume that SVP is a stratification factor rather than a human capital variable and we evaluate the white male equation once again, we eliminate practically all of the difference in earnings between the two groups. Only .02/.40=5 percent of the differential is directly due to sex-related differences in schooling, training, migration, and "experience." Given the measurement of experience this may be a slight underestimate of the full impact of human capital, but the thrust of the result still stands even if we discount this variable by a large percentage. The huge wage difference between white men and women cannot be attributed to the latter's underinvestment in human capital. Crowding and other forms of labor market discrimination play a much more critical role, although other factors not included in the model may be most important.

TABLE 5.10

POTENTIAL WAGE RAGES FOR WHITE FEMALE WORKERS
UNDER VARYING ASSUMPTIONS ABOUT THEIR
CHARACTERISTICS

Assumptions	$(WM\frac{}{wm}=\$3.42)$ Wage	BM/WM Ratio
$WF\frac{}{wf}$ HC, Strat, Ind, WC	$2.05	.60
$WM\frac{}{wf}$ HC, Strat, Ind, WC	3.09	.90
$WM\frac{\overline{wf}HC}{wm}$ Strat, Ind, WC	3.18	.93
$WM\frac{\overline{wf}HC(-SVP)}{wm}$ Strat, Ind, WC, SVP	3.36	.98

Black Females – Black women are by far the poorest paid members
of the workforce. With an average wage of $1.66 an hour in 1967,
black women earned only 48.5 percent of the average wage for white
men and 81 percent of that for white women. Unlike white women, however,
the general model of wage determination is capable of explaining a
good portion of the variance in their earnings. The human capital
module alone is responsible for 29 percent of the variance and the
complete equation has a corrected R^2 of .431, the highest among the
four race-sex groups.

Schooling plays a much more important role for black women
than it does for either of the other minority groups. This is primarily

due to the impact of education on occupational mobility.[36] A year

of additional schooling (at the mean) in the non-south yields a wage

increment of $.09 an hour; in the south, $.06. This is more than

fifty percent higher than for white women and equal to the wage

increment for black men. Because of the extremely low opportunity cost

of additional schooling, the rate of return for black women is only

second to that of white men. A marginal year of schooling yields a

4-3/4 percent rate of return, only 3/4 of a percentage point behind

the white male rate.

Neither institutional training nor experience are significant in

this equation. But the coefficient on migration suggests southern

emigration is useful for black women whether the main motive for

relocation is directly economic or not. A black woman who relocates

earns, on average, 14.2 percent more ($.22) than a similar worker

who never moved more than 50 miles from her childhood home.

Specific vocational preparation is not significant (even at the

.05 level) in the human capital equation. After controlling for

industry characteristics and union membership, however, SVP becomes

significant at the .01 level with each unit of on-the-job training

yielding approximately the same return as for white women ($.047).

The addition of the three remaining modules increases the $\bar{R}^2$ to

.431 and reduces the SEE to $.507. In dollar terms, union membership

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[36]For a more detailed analysis of this point, see Bluestone,
Murphy, and Stevenson, op. cit.

is worth $.29 an hour, an amount equivalent to that for both white
men and women. Because of lower average earnings, membership is
valued at 18 percent, more than four times the value for white men and
27 percent more than for white women. Segmentation into minority-
impacted industries is also much more important for black women than
for any of the other groups. The ±1σ evaluation of %MININD is valued
at $.38 an hour, almost twice the effect found elsewhere. This is
fully consistent with other data which suggest that black women have
historically been segregated into a very small number of industries
and occupations, many of which are related to domestic and personal
service. The one significant industry variable in the final equation
is concentration; here the ±1σ evaluation is worth $.16 an hour.
Together, union membership, %MININD, and concentration are worth $.83
an hour, exactly half of the mean wage rate.

Evaluating the white male equation at the black female means
furnishes added evidence of the qualitative difference in the earnings
functions between the two groups. When the white male equation is
evaluated with all of the black female means, the wage ratio rises
steeply from .485 to .75. In this case the higher wages for black
women would be due to the higher gross returns on their human capital
and the smaller impact of being assigned to minority dominated
industries. (See Table 5.11)

If black women were to gain access to the same set of industries
as white men the wage ratio would rise still further to .84. In this
case, human capital differences would be responsible for .16(1-.485)=31

percent of the total wage differential. The other 69 percent would be due to differences in the structure of the earnings functions (varying gross returns) and differential access to industries and occupations. If we then assume that SVP is a stratification variable the difference in human capital endowments is left to explain only 16 percent of the total wage differential. This is a good deal more than for white women but substantially less than for black men.

TABLE 5.11

POTENTIAL WAGE RATES FOR BLACK FEMALE WORKERS UNDER
VARYING ASSUMPTIONS ABOUT THEIR CHARACTERISTICS

Assumptions	$(WM_{\overline{wm}}=\$3.42)$ Wage	BF/WM Ratio
$BF_{\overline{bf}}$ HC, Strat, Ind, WC	$1.66	.485
$WM_{\overline{bf}}$ HC, Strat, Ind, WC	2.55	.75
$_{WM}{}^{\overline{bf}}_{\overline{wm}}{}^{HC}_{Strat, Ind, WC}$	2.86	.84
$_{WM}{}^{\overline{bf}}_{\overline{wm}}{}^{HC(-SVP)}_{Strat, Ind, WC, SVP}$	3.14	.92

All of the minority group results thus point overwhelmingly to the importance of factors other than human capital in explaining the large wage differentials between groups. Differences in schooling, institutional training, migration, and experience can explain only two-fifths of the differential between white and black males, only a sixth of the BF/WM differential and only a twentieth of the differential between white men and women. The remaining portion of the differential

is due to a combination of stratification mechanisms: unionism, "crowding," and pure wage discrimination.

The relative unimportance of human capital differences may be due in part to the specification of the pooled regressions. The absence of a log linear dependent variable and interaction terms for education, experience, and training may be responsible for this result. But other investigations come to very similar conclusions as ours using different techniques and data sources. Blinder's study of wage discrimination using Michigan Survey Research Center data concludes that the amount of intergroup wage differentials which can be explained by differences in personal endowments is even smaller than that found in the present study.[37] For the male wage differential, Blinder concludes that only 30 percent can be attributed to differences in endowments while virtually none of the white male/female differential is due to these factors.[38] Using still different techniques, both Michelson and Siegel have also questioned the importance of human capital endowments in explaining white/black income differences.[39]

THE "GRAND" POOLED REGRESSIONS

The final three regressions reported in this chapter are for the total full-time full-year privately employed labor force. Even if

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[37] Alan S. Blinder, "Wage Discrimination: Reduced Form and Structural Estimates," Journal of Human Resources, Fall 1973.

[38] Ibid., pp. 447, 449.

[39] See Stephan Michelson, Incomes of Racial Minorities (Washington: The Brookings Institution, 1968) unpublished manuscript; and Paul Siegel, "On the Cost of Being a Negro," Sociological Inquiry, Winter 1965.

somewhat imprecise due to their specifications, these equations do
clarify the dimensions of "crowding." The numerous caveats regarding
their interpretation have already been discussed.

When regressed alone the human capital module explains 24 percent
of the variance in all earnings. A year of schooling is worth $.15 an
hour ($.127 in the south) which translates into an average 4.5 percent
rate of return on the foregone income opportunity cost of schooling.
The training variable is significant with enrollment in an institutional
vocational program worth over $.23 an hour. Migration is worth $.33
while each year of experience is valued at nearly 6/10 of a cent and
each unit of SVP adds $.21 an hour. The mean wage for this 1967
composite sample is $2.96 with a standard deviation of $1.52.

Using this equation it is possible to estimate the range in
earnings under different assumptions about schooling, SVP, training, and
experience. For simplicity we assume throughout that schooling was
taken outside the south ("school-south"=0) and that migration had been
undertaken ("migration"=0). These results are reported in Table 5.12a-c
along with the estimated earnings for each of the individual race-sex
groups calculated from their own occupation-pooled regressions. The
row W* in this table refers to the estimated wage for the "grand" pooled
regression. All of the estimates are made from the human capital
equations reported in Table 5.8. The four rows below the dollar esti-
mates give the percentage differentials from the grand pooled wage for
each of the race-sex groups. In all but a very few cases, white men
have wages in excess of the grand pooled estimates while each of the

TABLE 5.12a

ESTIMATED HOURLY EARNINGS UNDER VARIOUS ASSUMPTIONS
CONCERNING THE HUMAN CAPITAL MODULE IN THE
OCCUPATION-POOLED REGRESSIONS:
SCHOOL COMPLETED=8 YEARS

School Completed	8 Years							
SVP	2				6			
Training	No		Yes		No		Yes	
Experience	5	20	5	20	5	20	5	20
W^*	$1.98	$2.07	$2.21	$2.30	$2.81	$2.90	$3.04	$3.13
W_{wm}	2.20	2.38	2.20	2.38	2.84	3.02	2.84	3.02
W_{bm}	2.31	2.41	2.55	2.65	2.57	2.67	2.80	2.91
W_{wf}	2.15	2.15	2.15	2.15	2.34	2.34	2.34	2.34
W_{bf}	1.72	1.72	1.72	1.72	1.87	1.87	1.87	1.87
	%	%	%	%	%	%	%	%
$(W^*-W_{wm})/W^*$	+11.1	+15.0	− .5	+3.5	+1.1	+4.1	−6.6	−3.5
$(W^*-W_{bm})/W^*$	+16.7	+16.4	+15.4	+11.3	−8.5	−7.9	−7.9	−7.0
$(W^*-W_{wf})/W^*$	+8.6	+3.9	−2.7	−6.5	−16.7	−19.3	−23.0	−25.2
$(W^*-W_{bf})/W^*$	−13.1	−16.9	−22.2	−25.2	−33.5	−35.5	−38.5	−40.3

TABLE 5.12b

ESTIMATED HOURLY EARNINGS UNDER VARIOUS ASSUMPTIONS
CONCERNING THE HUMAN CAPITAL MODULE IN THE
OCCUPATION-POOLED REGRESSIONS:
SCHOOL COMPLETED=12 YEARS

School Completed	12 Years							
SVP	2				6			
Training	No		Yes		No		Yes	
Experience	5	20	5	20	5	20	5	20
W^*	$2.59	$2.68	$2.82	$2.91	$3.42	$3.51	$3.65	$3.74
W_{wm}	3.01	3.19	3.01	3.19	3.65	3.83	3.65	3.83
W_{bm}	2.67	2.77	2.91	3.01	2.93	3.03	3.16	3.27
W_{wf}	2.38	2.38	2.38	2.38	2.57	2.57	2.57	2.57
W_{bf}	2.08	2.08	2.08	2.08	2.23	2.23	2.23	2.23
	%	%	%	%	%	%	%	%
$(W^*-W_{wm})/W^*$	+16.2	+19.0	+6.7	+9.6	+6.7	+9.1	0.0	+2.4
$(W^*-W_{bm})/W^*$	+3.1	+3.4	+3.2	+3.4	-14.3	-13.7	-13.4	-12.6
$(W^*-W_{wf})/W^*$	-8.1	-11.2	-15.6	-18.2	-24.9	-26.8	-29.6	-31.3
$(W^*-W_{bf})/W^*$	-19.7	-22.4	-26.2	-28.5	-34.8	-36.5	-38.9	-40.4

TABLE 5.12c

ESTIMATED HOURLY EARNINGS UNDER VARIOUS ASSUMPTIONS
CONCERNING THE HUMAN CAPITAL MODULE IN THE
OCCUPATION-POOLED REGRESSIONS:
SCHOOL COMPLETED=16 YEARS

School Completed	16 Years							
SVP	2				6			
Training	No		Yes		No		Yes	
Experience	5	20	5	20	5	20	5	20
W^*	$3.20	$3.29	$3.43	$3.52	$4.03	$4.12	$4.26	$4.35
W_{wm}	3.82	4.00	3.82	4.00	4.46	4.64	4.46	4.64
W_{bm}	3.03	3.13	3.27	3.37	3.29	3.39	3.52	3.63
W_{wf}	2.61	2.61	2.61	2.61	2.80	2.80	2.80	2.80
W_{bf}	2.44	2.44	2.44	2.44	2.59	2.59	2.59	2.59
	%	%	%	%	%	%	%	%
$(W^*-W_{wm})/W^*$	+19.4	+21.6	+11.4	+13.6	+10.7	+12.6	+4.7	+6.7
$(W^*-W_{bm})/W^*$	−5.3	−4.9	−4.7	−4.3	−18.4	−17.7	−17.4	−16.6
$(W^*-W_{wf})/W^*$	−18.4	−20.7	−23.9	−25.9	−30.5	−32.0	−34.3	−35.6
$(W^*-W_{bf})/W^*$	−23.8	−25.8	−28.9	−31.3	−35.7	−37.1	−39.2	−40.5

minority groups falls below the respective grand means. Black males

with 12 years or less of schooling and little on-the-job training

comprise the one major exception to this rule. There is also a general

trend for the wages of minority groups to fall further behind W* as the

amount of SVP, training, and experience increases. This trend is less

pronounced for increases in schooling. This all reflects the lower

earnings elasticities (w.r.t. human capital) prevailing for minority

groups in the economy.[40]

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[40]It is tempting to interpret the W* in Table 5.12a-c as the
wage rates that would prevail for given human capital endowments in
the absence of "crowding." But this interpretation is not correct
except under extremely restrictive assumptions. For W* to be the
perfectly competitive ("uncrowded") wage, (1) the underlying distri-
bution of human capital must be identical for each of the subgroups
and (2) the ratio of the slopes of the sectoral demand curves must
be inversely proportional to the employment ratio in the previously
segregated sectors. Proposition (1) is required in order for the
grand pooled regression estimates of W* to equal the weighted mean
wage estimates summed over the race-sex subgroups ($\bar{W}_{rs}$). Proposition
(2) follows from the theory presented in Chapter III. The proof of
this is straight-forward.

Let (1) $w_1 = a_1 - b_1 E_1$

(2) $w_2 = a_2 - b_2 E_2$

and (3) $W^* = \bar{W}_{rs} = (w_1 E_1 + w_2 E_2)/(E_1 + E_2)$

with the first equality in (3) holding only if the human
capital distributions are identical.

If $w_1 = w_2$ in perfect competition, then from (1) and (2),

(4) $E_1 = (a_1 - a_2)/b_1 + (b_2/b_1)E_2$

If $a_1 = a_2$ equation (4) simplifies to the familiar inverse ratio

$(E_1/E_2) = (b_2/b_1)$

Substituting $E_1 = (b_2/b_1)E_2$ into (3) then yields

The addition of the three remaining modules boosts the $\bar{R}^2$ to
.333 with a large number of significant variables. In the stratifica-
tion module both %MININD and %MINOCC boast highly significant negative
coefficients. The usual ±1σ evaluations yield wage differentials of
$.38 and $.50 respectively. Union membership interacts with concentra-
tion to render the following effect:

	Concentration		
	20%	60%	
No union	$2.79	$3.08	+10.4%
Union	3.04	3.07	+ 1.0%
	+9.0%	0.0%	+10.0%

In competitive industries, union members earn approximately 9 percent
more than workers who do not belong to a trade union. But in the
oligopolistic sector, union membership has no particular impact on
relative earnings. It seems reasonable to believe that the small
effect reflects the relative extent of trade unionism in different
parts of the occupational hierarchy. With every few highly paid pro-
fessionals and technicians in occupations with organized trade unions
as usually defined, the cross occupation union variable tends to
underestimate the impact of trade union membership in specific occupation

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$$W^* = [(b_2/b_1)w_1 + w_2]/[(b_2/b_1)+1]$$

This reduces to $W^* = w_1 = w_2$ in perfect competition.

Without explicit knowledge of labor demand in each sector it is
impossible to determine the wage impact of desegregation.

and industry groups. Indeed, if individuals who belong to professional

organizations which behave like trade unions (e.g. the American

Medical Association) were assigned a dummy value for membership it

seems likely that the impact of the union variable would be much

greater in these equations.

Concentration itself is relatively powerful in the non-union

sector, but again in unionized industries greater concentration does

not translate into additional higher earnings. Yet, overall, a union

member in an oligopolistic industry earns 10 percent more than an

unorganized worker in the competitive sector of the economy.

All of the other industry module variables are significant as

well. The $\pm 1\sigma$ evaluations of after-tax profits, the capital/labor

ratio, and government demand are worth $.23, $.13, and $.12 respectively.

Together they play a not insignificant role in explaining existing wage

differentials even after controlling for the effect of concentration

and union membership. Finally, the physical demands factor is signifi-

cant but once more negative.

Adding the dummy variables for race and sex to this equation pro-

duces some further insights. While most of the coefficients on the

human capital variables remain unaltered, the statistical integrity of

"training" is compromised no matter when the dummy variable for sex is

added. The simple correlation between sex and training is relatively

small (-.145), but apparently multi-collinearity between several

variables in the human capital module and sex is sufficient to produce

this result.[41] No matter what the specific reason, however, there is

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[41]Investigation of step-wise regression results on the grand

enough other evidence to conclude that part of the explanation for

lower earnings among women is the result of less vocational training.

(VI)

$$w = .8519 + .1360 \text{ School} - .0146 \text{ School-South} + .1010 \text{ Training*}$$
$$\quad\quad (12.71) \quad\quad (2.81) \quad\quad (1.53)$$

$$- .2750 \text{ Migration} + .0078 \text{ Experience} + .1296 \text{ SVP}$$
$$\quad (5.50) \quad\quad (3.12) \quad\quad (7.41)$$

$$- .3438 \text{ \%MININD} + .0423 \text{ \%MINOCC*} + .3161 \text{ Union Member}$$
$$\quad (2.16) \quad\quad (.28) \quad\quad (3.42)$$

$$+ .7738 \text{ Concentration} - .6090 \text{ Union x Concentration}$$
$$\quad (6.03) \quad\quad (3.47)$$

$$+ 6.7310 \text{ After-tax profit rate} + .0009 \text{ Capital/Labor ratio}$$
$$\quad (4.09) \quad\quad (2.25)$$

$$+ 1.0652 \text{ Government Demand} - .1389 \text{ Physical Demands}$$
$$\quad (2.71) \quad\quad (3.72)$$

$$- .2920 \text{ Race} - 1.0648 \text{ Sex}$$
$$\quad (3.20) \quad\quad (14.29) \quad\quad \bar{R}^2 = .387 \quad\quad \text{SEE } 1.1922$$

Over a quarter of the white male workers in the sample had some form

of institutional training during their work careers. In contrast only

10 percent of the white women in the sample and 14 percent of

the black women reported institutional training.

Of even greater apparent interest, addition of the dummy variables

severely reduces the coefficient on the industry crowding variable

and totally eliminates the significance of the proxy for occupational

segregation. The coefficient on %MININD falls from -1.0032 to -.3438

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pooled equation indicates that the multicollinearity apparently arises
between training, sex, and SVP. In an equation with just school and
sex, training has an F-value of 9.07 if entered as the next variable
in the regression. If training is to be added to an equation with
school, sex, and SVP, the F-value for training (if entered) falls to
2.80, well below the F required for statistical significance.

while its t-value drops from over 6.3 to less than 2.2. Meanwhile the coefficient on %MINOCC declines from -.9075 with a t-statistic in excess of 6.5 to +.0423 with a paltry t of .28. At first glance this suggests the near total absence of "crowding" after controlling for "pure discrimination."

Combined with other information, however, this conclusion seems to be much more tenuous. Evidence from the (X^tX) matrix for the "grand" pooled regression combined with the highly significant coefficients on %MININD in virtually every one of the individual race-sex equations strongly hint that (1) industry and occupational crowding is widespread and that (2) workers in minority-crowded industries are paid less regardless of race and sex.

TABLE 5.13

PARTIAL (X^tX) MATRIX FOR "GRAND"
POOLED REGRESSION

	Race	Sex	%MININD	%MINOCC
Race	1.000	.006	.034	.051
Sex		1.000	.470	.637
%MININD			1.000	.389
%MINOCC				1.000

The complete elimination of %MINOCC from the final equation is most likely the result of collinearity with the better measured variable for sex. In effect occupational "crowding" appears to be so complete that it is impossible to independently measure its earnings effect. While there is then no definitive proof for the contention that

"crowding" bears much of the responsibility for the large wage

differentials found after controlling for human capital, the mass

of evidence points strongly in this direction. This conclusion is

reinforced by our previous findings of a significant coefficient on

%MININD in a large majority of the individual equations, particularly

in the lower occupation strata. Table 5.14 summarizes all of the

%MININD results. If the bulk of these had been insignificant, we would

have been much more hesitant to conclude that crowding plays a critical

role in wage determination.

TABLE 5.14

SUMMARY OF SIGNIFICANT %MININD FACTORS
(t-values in parentheses)

Race-Sex Group	1-3	5	6-9	12-14	15-17	Total
WM	-2.0851 (4.85)	- .8005 (2.91)		- .7850 (3.18)		- .5306 (2.47)
BM	- .7213 (2.86)	- .5723 (2.34)		- .8673 (2.14)	na	- .6746 (4.23)
WF	- .8593 (2.97)					- .5370 (3.00)
BF	-1.4104 (4.21)	- .5404 (1.96)		na	na	-1.0994 (6.59)
Cross	-1.1829 (4.03)	-1.1728 (6.22)	-1.2192 (4.37)	-1.0525 (5.25)		-1.0032 (6.31)
Cross w/R,S	-1.0019 (3.51)	- .4138 (2.13)	- .7200 (2.90)	- .8550 (4.29)		- .3438 (2.16)

Beyond this, the addition of the race and sex dummies to the "grand pooled" regression strengthens the impact of the demand side variables. Coefficients on concentration, after-tax profits, and government demand increase after the dummies are added and the negative coefficient on the union-concentration interaction term declines.

Finally we note that addition of the race and sex variables raises the $\bar{R}^2$ to .387, over 60 percent more than the coefficient of determination for the human capital equation alone. Clearly then, human capital is an important element in wage determination for the whole labor force, but the story is much more complicated than all that. This we shall see even more clearly in the next chapter.

CHAPTER VI

AN EVALUATION OF THE REGRESSION RESULTS

In the previous chapter we reported all of the regression results
and presented a preliminary analysis of each of the significant
variables. This analysis demonstrated the significance of institutional
and stratification factors in the determination of earnings and
provided substantial although not incontrovertible evidence of the
earnings impact of industry and occupational segregation. The present
chapter extends this analysis by estimating the overall magnitude of
earnings differentials for (a) workers who share the same human capital
but differ in industry and occupational attributes and (b) workers
who differ in human capital but work in similar industries and
occupations. Instead of using an ad seriatum analysis of variables
as in the former chapter, the present evaluation considers the
variables in each module as a unit (or ad conjunctum). In this way
the combined impact of labor supply restrictions can be measured as
well as the combined effect of the demand-side of the market. The
results confirm the significance of non-human capital factors for
virtually all members of the labor force and especially for minorities
and all those on the lower rungs of the skill hierarchy. As in the
previous chapter, each race-sex group is separately analyzed concluding
with an investigation of the total labor force.

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The Methodology

There are a number of methods that could have been used to estimate the relative strength of human capital and non-human capital factors as determinants of personal earnings. A brief review of some of these and the reasons for discarding the traditional ones serves to introduce the multivariate method finally chosen for this purpose.

The simplest method is probably an R^2 comparison or F-test. Given the nature of the regression procedure it is easy to measure how much additional variance in earnings can be explained by the inclusion of the stratification and industry variables. But it is not really the explained variance we are after. Instead we are seeking an indication of the <u>size of potential wage differentials</u> associated with the non-human capital factors. An R^2 comparison or F-test says nothing about this and therefore is inappropriate.

The traditional elasticity measure used in most economic analysis is somewhat more appropriate, but it too has a number of problems which cause us to reject it in this case. For one thing, point elasticities may tell very little about the relationship between a particular pair of factors when evaluated at points other than the mean. Constant elasticity measures can surely be calculated, but they may bear little resemblance to the real relationship between variables when evaluated near the tails of the distribution. While this is a relatively weak argument against the use of elasticity measures, there are additional arguments which are more cogent.

It makes sense to compare price elasticities for various goods or for various factors of production because the unit of analysis is the same throughout. But comparison of a "wage/concentration" elasticity with "wage/profit" or "wage/education" elasticities does not have the same appeal because of the very different units used to measure the exogenous factors. Comparing the price elasticities of apples and oranges has a common sense interpretation, but not so for a comparison of the earnings effect of years of education and after-tax profits.

A not unrelated problem arises from the non-marginal nature of variation in the exogenous factors used in this study. Infinitesimally small differences in human capital or industry and occupation characteristics do not accurately characterize changes in these variables. Normally we are interested in the effect of an additional year of schooling—or even the attainment of a diploma or degree—not the impact, say, of a one percent increase in schooling past the eighth grade. The same can be said for concentration and other industry factors. For this reason, Weiss, for instance, uses given levels of unionization and concentration in evaluating his equations, not elasticities.[1] In the final analysis, what we are after is a measure of some _range_ of earnings over some _range_ of its determinants.

Such a range can be estimated by measuring continuous variables at arbitrary distances from their means and measuring dichotomous

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[1] See Weiss, "Concentration and Labor Earnings," _op. cit._

variables at zero and one (e.g. no-training/training). One con-
venient method is to evaluate individual variables at ± one standard
deviation from their mean values as we did in the last chapter.
For a normal distribution this yields a range over the middle 2/3 of
the observations. For other than normal distributions, the range
seldom includes less than 1/2 or more than 2/3 of all the observations,
making this measure variable, but bounded. Such a measure, of course,
does not cover the full range of a variable's distribution and there-
fore in most cases provides a somewhat conservative estimate of the
potential total impact of a given exogenous factor.[2] In our desire
to err on the conservative side if necessary, this is a satisfactory
measure if only a single variable is to be evaluated.

But by its nature such a single variable measure cannot provide
an unbiased estimate of the impact of a combination of factors
analyzed ad conjunctum. For present purposes such a technique is
required for ultimately we wish to estimate the earnings impact of
employment in a given multivariate "economic environment"--defined by
a combination of an industry's concentration, profitability, and say,
capital-intensity or the combined effect of industry and occupational
segregation. The ad seriatum measure tends in almost all instances
to give an upward biased estimate of the combined range and in fact
may result in evaluation of the regression at points well outside of

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[2]Recall Chapter V fn. 3 for an extended discussion of this
evaluation technique.

the data's regime. It may happen, for instance, that within all of
the observations in a given occupation stratum, no single individual
can be found in an industry which is simultaneously 1σ greater on each
of the separate industry measures. In this case it is obviously
improper to evaluate the equation by summing the $\pm 1\sigma$ wage differentials.

To overcome this deficiency a multivariate measure was devised
that accounts for the actual variation in the exogenous variables
taken as a unit.[3] Use of this measure normally prevents an estimate
of a wage differential larger than the data's full regime and virtually
always smaller than the ad seriatum estimate. Consequently it tends
to further restrict the measured wage range due to industry and
occupation variables--once more yielding a conservative estimate of
these factors. Separate unit estimates were made for the stratification
and industry modules. In evaluating the equations for the impact of
"complex crowding," the two estimates were then added together.[4]

The Z* Measure

The ad conjunctum measure used in this part of the analysis
involves estimating the standard deviation of a linear combination of
the continuous variables in a given module using the regression

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[3]I am indebted to Prof. Malcolm Cohen of the Institute of Labor
and Industrial Relations, University of Michigan for suggesting this
measure to me.

[4]This may lead to a slight upward bias in these estimates for
precisely the same reason that we rejected the ad seriatum measure, but
the opposite signs on the stratification and industry module variables
precluded the use of a joint ad conjunctum technique.

coefficients as scalars. The standard deviation thus derived will be known as Z*, not to be confused with z-transformations or other statistical parameters. A Z* range is calculated for each industry and stratification module based on the regression equations reported in the last chapter. The derivation of this multivariate measure is generally straight-forward.

Let a_i be the estimated regression coefficient where X_{ij} is the jth observation on the ith continuous variable. Z_j is then the jth linear combination of the X_i vectors.

$$a_1 X_{11} + a_2 X_{21} + \ldots + a_m X_{m1} = Z_1$$

$$a_1 X_{12} + a_2 X_{22} + \ldots + a_m X_{m2} = Z_2$$

$$\vdots \qquad \vdots \qquad \qquad \vdots \qquad \vdots$$

$$a_1 X_{1n} + a_2 X_{2n} + \ldots + a_m X_{mn} = Z_n$$

or in vector notation:

$$a_1 X_1 + a_2 X_2 + \ldots + a_m X_m = Z$$

From this set of linear combinations, the mean of Z_j $(=\bar{Z})$ can be calculated as well as its standard deviation Z*.

$$Z* = \sqrt{\frac{\sum_{j=1}^{N} (Z_j - \bar{Z})^2}{N-1}}$$

The measure ±Z* then provides a direct reading of the range in the exogeneous variable due to the combined variation in the X_i's. In the

present case, $\pm Z_S^*$ is the ad conjunctum measure for the effect of the

stratification module (excluding the dichotomous variable, "union

member") while $\pm Z_I^*$ is an analogous measure for the industry module.

Intuitively, $-Z_S^*$ is the wage differential associated with an

industry-occupation "environment" which has "one standard deviation"

less minority employment. The estimate $+Z_I^*$ is the wage differential

associated with a "permissive economic environment" assessed on the

basis of such factors as concentration, after-tax profits, capital-

intensity or government demand.

The superiority of this unit measure over the ad seriatum

technique can be demonstrated, first by specific example and then

more generally. It will be shown that the ad seriatum estimate is

always biased upward except in the improbable case of perfect

positive pairwise correlation between exogenous variables. The

following simple but generalizable two-variable two-observation example

demonstrates the bias in the ad seriatum measure and the corrected

estimate generated by the Z* method.

Assume a regression has been generated for Y containing two

observations and two dummy independent variables, X_1 and X_2.[5] In

order to simplify the example, let the final regression have the

form: $Y = .25X_1 + .25X_2 + c$. With this limited information we can

compare the ad seriatum (Z') and ad conjunctum (Z*) evaluations of

the X module under the assumption of a positive correlation between

X_1 and X_2. In this case, the values of the two evaluation estimates

will be identical (Z'=Z*).

---

[5]Obviously such a regression could not actually be generated

Ad Seriatum (Z')   Ad Conjunctum (Z*)

$$X_1 \qquad X_2$$

$$.25\begin{pmatrix}0\\1\end{pmatrix} + .25\begin{pmatrix}0\\1\end{pmatrix}$$

$$X_1 \qquad\quad X_2 \quad Z$$

$$[(.25 \times 0) + (.25 \times 0)] = 0$$

$$[(.25 \times 1) + (.25 \times 1)] = .50$$

$$Z' = .25\sigma_{X_1} + .25\sigma_{X_2}$$

$$Z* = \underline{.3535}$$

$$= .1767 + .1767$$

$$Z' = \underline{.3535}$$

In the opposite case where X_1 and X_2 are negatively correlated, the Z' and Z* evaluations are no longer equal, the former generating a value no different from the case of positive correlation, but the latter equal to zero.

Ad Seriatum (Z')   Ad Conjunctum (Z*)

$$X_1 \qquad X_2$$

$$.25\begin{pmatrix}0\\1\end{pmatrix} + .25\begin{pmatrix}1\\0\end{pmatrix}$$

$$X_1 \qquad\quad X_2 \quad Z$$

$$[(.25 \times 0) + (.25 \times 1)] = .25$$

$$[(.25 \times 1) + (.25 \times 0)] = .25$$

$$Z' = .25\sigma_{X_1} + .25\sigma_{X_2}$$

$$Z* = \underline{.0000}$$

$$= .1767 + .1767$$

$$Z' = \underline{.3535}$$

---

because of its singularity.

In this case the "standard deviation" of the X module as measured by Z* is zero because of the perfect offsetting impacts of X_1 and X_2 (given identical regression coefficients). This is, of course, the correct estimate of the differential in Y due to the combined effect of the X_i, for any "gain" due to having the characteristic X_1 is simultaneously offset by an identical "loss" in Y due to the absence of X_2, and vice-versa. For the analysis at hand this would be similar to a situation where all industries with greater than average concentration had less than average profitability. Empirically the zero-order correlations for the industry and stratification variables are usually positive but far from unity. Consequently the Z* measure corrects for potential overestimates generated by the <u>ad seriatum</u> technique.

A more general demonstration of the properties of the Z* measure can be provided, again using two variables and two observations for expositional simplicity. What is to be proven is that:

(6.1)
$$\lim_{\rho_{X_1 X_2} \to +1} Z^* = Z'$$

(6.2)
$$\lim_{\rho_{X_1 X_2} \to -1} Z^* = 0$$

if $a_1 = a_2$ and where ρ is a zero-order correlation coefficient between independent variables

Define the <u>ad seriatum</u> measure in the usual fashion:

$$(6.3) \qquad Z' = a_1 \sigma_{X_1} + a_2 \sigma_{X_2}$$

and let Z* be the standard deviation of the linear combination of independent vectors (Z). The derivation of Z* is straightforward.

$$(6.4) \qquad a_1 X_{11} + a_2 X_{12} = Z_1$$

$$a_1 X_{21} + a_2 X_{22} = Z_2$$

From (6.4) the mean of Z ($\bar{Z}$) equals:

$$\frac{a_1(X_{11} + X_{21}) + a_2(X_{12} + X_{22})}{2} = \frac{Z_1 + Z_2}{2} = \bar{Z}$$

Therefore,

$$(6.5) \qquad a_1 \bar{X}_1 + a_2 \bar{X}_2 = \bar{Z}$$

The standard deviation of Z follows directly by definition:

$$(6.6) \qquad \sigma_Z = Z* = [\sum (Z_i - \bar{Z})^2 / (N - 1)]^{1/2}$$

Solving for Z* in terms of X_1 and X_2 can be done by first solving for the squared deviations.

$$(6.7) \qquad Z_1 - \bar{Z} = a_1 X_{11} + a_2 X_{12} - a_1 \bar{X} - a_2 \bar{X}_2$$

$$= a_1(X_{11} - \bar{X}_1) + a_2(X_{12} - \bar{X}_2)$$

Analogously,

(6.8) $\qquad Z_2 - \bar{Z} = a_1(X_{21} - \bar{X}_1) + a_2(X_{22} - \bar{X}_2)$

Then squaring both sides of (6.7) and (6.8) gives

(6.9) $\quad (Z_1 - \bar{Z})^2 = a_1^2(X_{11} - \bar{X}_1)^2 + 2a_1 a_2(X_{11} - \bar{X}_1)(X_{12} - \bar{X}_2) + a_2^2(X_{12} - \bar{X}_2)^2$

and $\quad (Z_2 - \bar{Z})^2 = a_1^2(X_{21} - \bar{X}_1)^2 + 2a_1 a_2(X_{21} - \bar{X}_1)(X_{22} - \bar{X}_2) + a_2^2(X_{22} - \bar{X}_2)^2$

And summing the squared deviations

$$(6.10) \qquad (Z_i - \bar{Z})^2 = a_1^2[(X_{11} - \bar{X}_1)^2 + (X_{21} - \bar{X}_1)^2]$$

$$+ 2a_1 a_2[(X_{11} - \bar{X}_1)(X_{12} - \bar{X}_2) + (X_{21} - \bar{X}_1)(X_{22} - \bar{X}_2)]$$

$$+ a_2^2[(X_{12} - \bar{X}_2) + (X_{22} - \bar{X}_2)^2]$$

Finally dividing both sides by N-1 (=1) gives the variance in Z.

(6.11) $\qquad Z^{*2} = a_1^2 \sigma_{X_1}^2 + 2a_1 a_2 \text{cov}(X_1 \ X_2) + a_2^2 \sigma_{X_2}^2$

Now for Z^{*2} to equal Z'^2, then

$$(6.12) \quad a_1^2 \sigma_{X_1}^2 + 2a_1 a_2 \text{cov}(X_1 \ X_2) + a_2^2 \sigma_{X_2}^2 = (a_1 \sigma_{X_1} + a_2 \sigma_{X_2})^2$$

$$= a_1^2 \sigma_{X_1}^2 + 2a_1 a_2 \sigma_{X_1} \sigma_{X_2} + a_2^2 \sigma_{X_2}^2$$

which simply reduces to

(6.13)
$$\text{cov}(X_1 \ X_2) = \sigma_{X_1} \sigma_{X_2}$$

Finally, dividing both sides by $\sqrt{\sigma_{X_1}^2 \sigma_{X_2}^2}$ provides a proof of (6.1).

(6.14)
$$\frac{\text{cov}(X_1 \ X_2)}{\sqrt{\sigma_{X_1}^2 \sigma_{X_2}^2}} = \rho_{X_1 X_2} = 1 \qquad \text{Q.E.D.}$$

To prove (6.2) divide both sides of (6.11) by $\sigma_{X_1} \sigma_{X_2}$ and set $a_1 = a_2 = a$.

This gives

(6.15)
$$\frac{Z*^2}{\sigma_{X_1} \sigma_{X_2}} = \frac{a^2 \sigma_{X_1}^2}{\sigma_{X_1} \sigma_{X_2}} + \frac{2a^2 \text{cov}(X_1 \ X_2)}{\sigma_{X_1} \sigma_{X_2}} + \frac{a^2 \sigma_{X_2}^2}{\sigma_{X_1} \sigma_{X_2}}$$

Then setting $\text{cov}(X_1 \ X_2)/(\sigma_{X_1} \sigma_{X_2}) = \rho_{X_1 X_2} = -1$ and cancelling yields

(6.16)
$$\frac{Z*^2}{\sigma_{X_1} \sigma_{X_2}} = \frac{a^2 \sigma_{X_1}}{\sigma_{X_2}} + \frac{a^2 \sigma_{X_2}}{\sigma_{X_1}} - 2a^2$$

Remultiplying both sides of (6.16) by $\sigma_{X_1} \sigma_{X_2}$ yields:

(6.17)
$$Z*^2 = a^2\sigma_{X_1}^2 - 2a^2\sigma_{X_1}\sigma_{X_2} + a^2\sigma_{X_2}^2$$

$$= (a\sigma_{X_1} - a\sigma_{X_2})^2$$

Finally, taking the square root of both sides leaves an expression for Z*

(6.18)
$$Z* = a\sigma_{X_1} - a\sigma_{X_2} = a(\sigma_{X_1} - \sigma_{X_2})$$

Thus when $\rho_{X_1 X_2} = -1$, $Z* = 0$ if either of two conditions holds:

(1) $a_1 = a_2 = a = 0$

or (2) $\sigma_{X_1} = \sigma_{X_2}$, when $a_1 = a_2$ Q.E.D.

The first condition is trivial, showing only that the X module has no impact on Y when the regression coefficients on X_i are insignificant. Condition (2) is more substantive, demonstrating that the impact of a given module is zero when there is identical variance in all of the exogenous factors and the variables are inverse correlates of each other. Thus the multivariate measure has the property of ranging from zero to Z' as the correlation between paired explanatory variables runs from negative to positive one. This is, of course, a desirable property for such a statistic.

The Results

In the actual estimates that follow, a Z* is calculated for
the industry and stratification modules wherever there are two or
more continuous variables in a given module. Otherwise the equivalent
ad seriatum measure is used. Where the dichotomous variable, "union
member" is significant in a regression, it is evaluated at zero and
one and added linearly to the estimate of Z*. Consistent with the
rationale for "simple" and "complex" crowding, the regression
equations are evaluated at (a) the mean for all variables ($\bar{W}$), (b)
then at the mean for all of the variables excluding the stratification
factors which are evaluated at ($\pm Z* \pm UN$), and finally (c) at the mean
for all of the variables excluding those in the stratification and
industry modules both of which are evaluated according to the Z*
formula. This final statistic then measures the overall range in
earnings for a human capital constant population evaluated in terms
of $\pm Z_S^*$, $\pm UN$, and $\pm Z_I^*$. All of these range or interval estimates are
based on the regression equations recorded in Chapter V. The tabular
results that follow report hourly and annual earnings intervals as
well as associated percentage differentials.[6,7] Each race-sex group

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[6]In terms of annual earnings, full-time full-year employment
is assumed to be 52 weeks x 40 hours per week = 2080 hours/year.

[7]The two percentage earnings intervals are calculated in the
following way:

$$(1) \quad \frac{(-Z_S^* + UN + Z_I^*) - (+Z_S^* - UN - Z_I^*)}{(+Z_S^* - UN - Z_I^*)} \quad \text{"COMPLEX"}$$

is reported separately and followed by the results for the labor force
as a whole.

   White Males - As expected, the narrowest wage differentials due
to existing variation in non-human capital factors are found among
white men. Nevertheless these differentials are far from
inconsequential particularly in the lowest skill strata. (See Table
6.1) The results for occupation group 1-3, for instance, establish a
perfect example of the "simple crowding" phenomenon. Holding human
capital fixed, a full $1.00 an hour wage differential is found based
on an evaluation of the STRAT factors alone. On an annual basis this
amounts to an almost $2100 interval around a mean of $5637. The worker
in a "permissive economic environment" (based on union membership
and the degree of minority crowding) can expect on average to earn
nearly 1-1/2 times (146%) the earnings of a similarly skilled non-union
worker in a minority-crowded industry and over 17 percent more than
the average wage in this stratum. In this particular case the
comparison is between a union worker in an industry with 14 percent
minority employment and an equally skilled but unorganized employee
in an industry which has over 46 percent of its labor force composed
of white women and blacks of both sexes. In other strata the differ-
ential is by no means as large, but still exists.

$$(2) \qquad \frac{(-Z_S^* +UN) - (+Z_S^* -UN)}{(+Z_S^* -UN)} \qquad \text{"SIMPLE"}$$

TABLE 6.1

WAGE INTERVALS DUE TO STRATIFICATION AND
INDUSTRY FACTORS, BY OCCUPATION STRATUM
WHITE MALES

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval[a]	
	W	Annual W	%	$	%
1-3					
$-Z_S^* + UN + Z_I^*$	$3.18	$6614	17.34%	$1.00	45.87%
$-Z_S^* + UN$	3.18	6614	17.34	1.00	45.87
$\bar{W}$	2.71	5637	--		
$+Z_S^* - UN$	2.18	4534	-19.55		
$+Z_S^* - UN - Z_I^*$	2.18	4534	-19.55		
5					
$-Z_S^* + UN + Z_I^*$	3.17	6594	10.45	.61	23.82
$-Z_S^* + UN$	2.98	6198	3.83	.23	8.36
$\bar{W}$	2.87	5970	--		
$+Z_S^* - UN$	2.75	5720	-3.83		
$+Z_S^* - UN - Z_I^*$	2.56	5325	-10.45		
6-9					
$-Z_S^* + UN + Z_I^*$	3.41	7093	15.20	1.00	41.49
$-Z_S^* + UN$	3.41	7093	15.20	1.00	41.49
$\bar{W}$	2.96	6157	--		
$+Z_S^* - UN$	2.41	5013	-18.58		
$+Z_S^* - UN - Z_I^*$	2.41	5013	-18.58		

TABLE 6.1 (Continued)

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval[a]	
	W	Annual W	%	$	%
12-14					
$-Z_S^* + UN + Z_I^*$	$3.84	$7987	9.71%	$ .85	28.42%
$-Z_S^* + UN$	3.75	7800	7.14	.44	13.29
$\bar{W}$	3.50	7280	--		
$+Z_S^* - UN$	3.31	6885	-5.42		
$+Z_S^* - UN - Z_I^*$	2.99	6219	-14.57		
15-17					
$-Z_S^* + UN + Z_I^*$	5.11	10628	5.82	.56	12.40
$-Z_S^* + UN$	5.11	10628	5.82	.56	12.40
$\bar{W}$	4.83	10046	--		
$+Z_S^* - UN$	4.54	9443	-5.85		
$+Z_S^* - UN - Z_I^*$	4.54	9443	-5.85		
All Strata					
$-Z_S^* + UN + Z_I^*$	3.78	7862	10.52	.68	21.93
$-Z_S^* + UN$	3.52	7322	2.92	.16	4.76
$\bar{W}$	3.42	7114	--		
$+Z_S^* - UN$	3.36	6989	-1.75		
$+Z_S^* - UN - Z_I^*$	3.10	6448	-9.35		

[a]The first row of statistics reports the interval between $-Z_S^* + UN + Z_I^*$ and $+Z_S^* - UN - Z_I^*$

The second row reports the interval between $-Z_S^* + UN$ and $+Z_S^* - UN$

Occupation stratum 5, as one may recall, is comprised mostly of operative and kindred workers. The evidence clearly indicates that there is less variation in wages due to industry factors in these fairly homogeneous occupations. Yet differences in the extent of minority employment by industry and concentration account for a $.61 earnings wedge between equivalent workers. On an annual basis this amounts to a $1270 earnings gap or 24 percent. If we were to disregard differences in industry demand characteristics and only evaluate the regression for variance in the stratification module, the total wage range would be only $.23 or 8.36 percent. Much of the total wage differential is consequently explained by differences in industrial concentration given initial labor supply restrictions.

In occupation stratum 6-9, composed of many of the skilled trades, union membership plays the critical role in the distribution of earnings. Union membership alone is worth $.76 an hour (see Chapter V) out of a total wage differential of $1.00, the remaining gap due to the fact that apparently some white men are "trapped" in occupations crowded with black male workers. The $1.00 an hour amounts to a 41.5 percent earnings differential between workers of apparently equal endogenous productivity. The difference on an annual basis is $7093 vs. $5013.

A significant wage differential even prevails among white male workers in the relatively highly skilled occupation stratum 12-14. Here there is a $.44 earnings gap between workers who differ by $\pm Z_s^*$ and union affiliation and an additional $.41 due to differences in the

industry module. Summed together this drives a 28 percent wedge
between the annual earnings in a "permissive" vs. "repressive"
economic environment.

Only for the very most skilled white male professional workers
is the differential relatively unimportant. Here non-human capital
factors are responsible for no more than a 12.5 percent wage gap
between similarly qualified workers and the full extent of this range
is apparently related solely to differences in industry profitability.

When we turn to evaluate the white male equation across all
occupation strata, thus accounting for the full effect of human capital,
we again find a relatively large wage differential due to stratification
and industry factors, particularly the latter. Stratification factors
(after controlling for the interaction between union membership and
concentration) produce only a 4.76 percent wage differential. Once
the Z_I^* is added, however, the total earnings gap rises to $.68 or
nearly 22 percent. On an annual basis this amounts to a more than
$1400 differential with earnings ranging from $3.10 an hour to $3.78.
While these industry and stratification associated wage differentials
are much smaller than for each of the minority groups, they are by
no means insignificant and certainly too large to ignore. The major
unanswered question is how to explain them.

Where much of the earnings differentials between race-sex
groups can be charged to discrimination in its many forms, this
explanation is mostly useless for the dominant white male group.
However, a number of possible alternative explanations can be

ascertained. One hypothesis consistent with radical stratification theory maintains that wage differences among similarly qualified white men are due to unspecified variation in the workers' social class origins. Accordingly, higher wage workers have benefitted from being nurtured in an environment of financially and socially well-to-do families. Unfortunately we have not been able to control for this factor due to data limitations. Ultimately the social class hypothesis may explain some of the wage difference associated with industry and stratification factors, but at this point we have no proof.[8]

Another explanation might lie in compensatory wage payments which do not show up in the analysis of earnings or in fringe benefits that are inversely correlated with straight-time hourly wages. What evidence we have on compensatory payments seems to indicate just the opposite however. The physical demands variable in the white male cross strata equation is significant but _negative_. Little hard evidence exists on the fringe benefit question, but casual observation seems to indicate a probable positive correlation between wages and

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[8]What evidence does exist on this subject tends to deny the importance of social class as a determinant of the variance in income. In his study of _Inequality_, Christopher Jencks concludes that in fact most of the variation in men's incomes appears to be stochastic.

"Neither family background, cognitive skill, educational attainment, nor occupational status explains much of the variation in men's incomes. Indeed, when we compare men who are identical in all these respects, we find only 12 to 15 percent less inequality than among random individuals."

Christopher Jencks, _Inequality: A Reassessment of the Effect of Family and Schooling in America_ (New York: Harper & Row, 1972), p. 226.

non-wage supplements.

A more plausible hypothesis relies on the existence of widespread imperfections in information about job opportunities. This of course makes a good deal of sense at least as an explanation of short-run wage differences. Such imperfections could well explain wage intervals of the magnitude found in the higher skill categories. Larger more permanent differentials, it would seem, require a more complex hypothesis.

One such possible hypothesis can be derived from a synthesis of theories based on the work of Thurow and Lucas[9] (the "job competition" thesis), Becker[10] and Oi[11] (the concept of labor as a "quasi-fixed" factor) and the institutionalists (the importance of "lock-in" effects in the supply of labor). According to the job competition thesis, individuals compete for jobs based on their background characteristics, not in terms of wage demands as standard neoclassical theory suggests. One can imagine a queue of jobs defined by a set of characteristics with the hourly wage rate being one of the defining parameters.[12]

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[9] Lester C. Thurow and Robert E.B. Lucas, The American Distribution of Income: A Structural Problem, A Study Prepared for the Joint Economic Committee of the U.S. Congress (Washington, D.C.: U.S. Government Printing Office, March 17, 1972), esp. pp. 19-39.

[10] Gary Becker, Human Capital, Chapter 11, op. cit.

[11] Walter Oi, "Labor as a Quasi-Fixed Factor," Journal of Political Economics, December 1962.

[12] One very difficult question is left unanswered by the job competition model: what determines the distribution of wages in the first place? If labor supply and demand factors are so weak as to leave the wage indeterminate, what other factors define the actual wage

Workers compete for these job/wage slots by presenting themselves in

the job market to potential employers. Firms then choose employees

on the basis of expected training costs (given their background

characteristics), hiring first those with the lowest expected employment

cost and then moving down the queue to higher cost labor if demand

warrants.

If we apply this model over the business cycle, we can generate

a pattern so that at any given point in time workers of identical

endogenous productivity will be found in different job slots and thus

earn various wage rates. This will occur as a worker who enters the

job market during a period of tight demand will have a greater

probability of finding a higher paying job while the worker who joins

the market in a contractionary period may have to accept a lower

paying job for the same amount of search effort. If search costs were

low, the fixed cost of hiring and training labor were minimal, and

there were no substantial "lock-in" effects, earnings differentials

would only be temporary for lower wage workers would continually reenter

the job market in an attempt to gain employment in the higher wage job

slots consistent with their endogenous productivity. A strong tendency

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paid on a given job? One possible answer is that supply and demand
are responsible for setting a wage range for every "job" but that
custom and inertia--as well as institutional factors including union
pressure--are responsible for setting and holding the wage distribution
as it is. Once established the pattern of wages changes only slowly
in response to real changes in supply and demand. For the most part
the wage distribution is never in equilibrium accounting for a good
deal of structural unemployment in all labor markets.

toward equal returns for identical personal characteristics would be the consequence.

In fact, however, labor is usually a "quasi-fixed" factor, search costs are often substantial, and "lock-in" effects are extensive. Specific training costs will often be shared by both the worker and the firm (with the shares depending on expected turnover and quit rates).[13] Once workers have invested in specific training in a particular slot, their marginal products and therefore their wages are presumably higher than in alternative employment. Consequently a worker will tend to remain in a job for which he has already paid for training rather than quit to begin a new job at a lower wage rate in hopes of working up to a higher one. Employers too will be reluctant to dismiss already trained employees so as to hire replacements even if the potential recruits embody superior background characteristics. Thus where labor has a high degree of "fixity," to use Oi's term, there will be a tendency for workers to stay where they are (and employers to keep them) even in the face of fairly substantial differences in hourly rates. This, of course, is fully consistent with individual utility functions which posit that workers attempt to maximize the expected value of lifetime income rather than simply maximize their wage.

The foregoing eclectic theory is obviously suggestive for the more skilled workforce, those in our sample with high SVP levels for

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[13]See Becker, _Human Capital_, _op. cit._, pp. 21-22.

instance. But the largest wage differentials due to other than
human capital factors are found among the least skilled workers,
presumably those with a low degree of "fixity." For them the
"quasi-fixed" factor theory does not directly apply, but an insti-
tutional variant along the same theme does. Specific training and
hiring costs produce one form of "lock-in" effect, where the more
common mechanisms are seniority privileges and non-vested pensions,
both of which apply to the full occupation spectrum, the lowest skill
strata included. In attempting to maximize expected lifetime income
a worker with many years of seniority and associated pension rights
will not move to a job with a higher hourly wage rate if this means
sacrificing the employment security which goes along with seniority
(particularly in unionized firms) and the surrender of expected
retirement income. In this case fairly large wage differentials will
persist over time once the differentials exist at all.

Unfortunately we do not have any data to test this hypothesis,
but it seems a likely candidate to explain the substantial and
probably persistent wage differences found among all but the most
skilled white male workers. "Entrapment" through fixed training costs,
imperfections in information, and non-vested seniority and pension
privileges may very well be responsible for driving a wedge of as much
as $2100 in annual earnings between white male workers who have
substantially the same human capital attributes.

Black Males - Once we leave the realm of white male workers,
the impact of industry and stratification factors becomes much more

significant. This can readily be seen in an evaluation of the black
male regressions. (See Table 6.2) In virtually every one of these,
there is extensive evidence of "complex crowding" with union member-
ship playing a consistently effective role in every stratum. The
percentage earnings gap is as high as 75 percent (Occ Stratum 1-3)
and the annual dollar difference, according to our evaluation
technique, reaches almost $2800 (Occ Stratum 12-14).

Union membership and industry segregation are responsible for a
35 percent differential among black men in the lowest skilled occupa-
tion category. Adding the combined effect of differences in concentra-
tion and government demand raises the total differential to 75.8 percent
or a $1.20 an hour range around a mean of only $2.17. The stratification
and industry modules apparently contribute about equal weight to the
overall wage gap. In occupation group 5 composed predominantly of
operatives and janitors and sextons, the total earnings differential
is of almost identical magnitude (74.9%), but nearly two-thirds of
the total is due to stratification factors--mainly union membership--
while the remainder is due to the single industry factor, concentra-
tion (see Chapter V). This is in sharp contrast to the white male
regression for this stratum where we found only a small earnings
differential (23.8%). Of this only a quarter was due to stratification
factors and union membership apparently played no role at all. The
rest of the relatively small $.61 differential was due to differences
in concentration.

TABLE 6.2

WAGE INTERVALS DUE TO STRATIFICATION AND
INDUSTRY FACTORS, BY OCCUPATION STRATUM
BLACK MALES

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval	
	W	Annual W	%	$	%
1-3					
$-Z_S^* + UN + Z_I^*$	$2.78	$5782	28.11%	$1.20	75.80%
$-Z_S^* + UN$	2.51	5221	15.66	.65	34.94
$\bar{W}$	2.17	4514	--		
$+Z_S^* - UN$	1.86	3869	-14.28		
$+Z_S^* - UN - Z_I^*$	1.58	3286	-27.13		
5					
$-Z_S^* + UN + Z_I^*$	2.99	6219	25.10	1.28	74.85
$-Z_S^* + UN$	2.75	5720	15.06	.80	41.02
$\bar{W}$	2.39	4971	--		
$+Z_S^* - UN$	1.95	4056	-18.41		
$+Z_S^* - UN - Z_I^*$	1.71	3557	-28.45		
6-9					
$-Z_S^* + UN + Z_I^*$	2.87	5970	21.73	.95	49.23
$-Z_S^* + UN$	2.70	5616	14.40	.60	28.57
$\bar{W}$	2.36	4909	--		
$+Z_S^* - UN$	2.10	4368	-11.01		
$+Z_S^* - UN - Z_I^*$	1.92	3994	-18.43		

TABLE 6.2 (Continued)

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval	
	W	Annual W	%	$	%
12-14					
$-Z_S^* + UN + Z_I^*$	$3.32	$6906	28.64%	$1.33	66.83%
$-Z_S^* + UN$	3.05	6344	17.76	.79	34.95
$\bar{W}$	2.59	5387	--		
$+Z_S^* - UN$	2.26	4701	-12.74		
$+Z_S^* - UN - Z_I^*$	1.99	4139	-23.16		
15-17					
$-Z_S^* + UN + Z_I^*$					
$-Z_S^* + UN$					
$\bar{W}$	SAMPLE SIZE TOO SMALL FOR SIGNIFICANT RESULTS				
$+Z_S^* - UN$					
$+Z_S^* - UN - Z_I^*$					
All Strata					
$-Z_S^* + UN + Z_I^*$	3.01	6261	27.00	1.15	61.82
$-Z_S^* + UN$	2.82	5866	18.98	.77	37.56
$\bar{W}$	2.37	4930	--		
$+Z_S^* - UN$	2.05	4264	-13.50		
$+Z_S^* - UN - Z_I^*$	1.86	3869	-21.51		

The total wage gap in occupation stratum 6-9 is smaller than in the other strata, a perplexing result at first glance. The full interval is 49.2 percent, not much greater than the differential for white men although still equivalent to almost $2000 on an annual basis. The relatively lower earnings gap is apparently related to weaker effects of both unionization and concentration but even more so to the virtual absence of any significant segregation factor. The perplexing result is made comprehensible once we recall that when segregation in a particular race-sex group is overwhelming, the true earnings differential may be empirically undetectable. The differential can only be uncovered by evaluating the pooled race-sex regressions.

Moving to the higher skilled occupation stratum 12-14, we find the percentage earnings range among black men to be more than double that of their white male counterparts and the dollar gap reaches a maximum for any group in any stratum ($1.33 an hour). About half the total differential is associated with the stratification module while the remaining half is due to differences in concentration. Based on the evaluation procedure, estimated hourly wages for this group span the interval $1.99 to $3.32. Unfortunately the data sample does not provide enough observations on professional black men to test whether the earnings differential substantially declines as for white men.

In turning to an examination of the cross occupation regression, one is immediately struck by the fact that the total percentage earnings differential is almost _three_ times that for white men. The

estimated range runs from $1.86 to $3.01 an hour compared with an

estimated range of $3.10 to $3.78 for white males. Of the full

$1.15 an hour wage spread due to stratification and industry factors,

$.77 is due to the "supply side" with the remaining amount the

effect of a linear combination of after-tax profits, capital/labor

ratios, and government demand. The average black man in the full-time

SEO sample earned $4930 on an annual basis, but given "average" human

capital characteristics, the same worker could earn anywhere from an

estimated $3869 to $6261 depending on how fortunate he was in finding

employment in an industry characterized by a "permissive economic

environment."

Much of this massive earnings differential may be explained by

the same factors as we hypothesized for white men: compensating non-

wage supplements, imperfections in labor market information, and

lock-in or entrapment effects. But in addition to these there is

considerable evidence of specifically race-linked segregation. The

estimated STRAT module induced wage interval for the white male

pooled regression is only $.16 an hour compared with the $.77 range

estimated for black men. Part of this large difference is due to the

much stronger impact of union membership on wage differentials while

the remaining is due to the greater impact of the industry segregation

factor %MININD.

White Females - The tale told in the evaluation of the white

female regression results is a similar one, but even more difficult

to uncover because of a much greater degree of occupational

segregation. The estimated percentage differentials generally lie between those of comparable white and black men. (See Table 6.3) In the lowest skilled category, only the stratification module is significant but union membership as well as a linear combination of both occupation and industry segregation provide a 42 percent earnings interval with a dollar value of $.62 around a mean of $1.74. The total differential in occupation stratum 5 is somewhat larger (54.6%), but here the range seems to be better explained by differences in industry characteristics with the stratification module contributing only $.24 to a total $.87 differential. Union membership is the only significant STRAT factor in this regression.

Again as in the black male results, the earnings gap in occupation group 6-9 is lower than in any other stratum (with the exception of the professional group). The total gap is $.56 or 35.4 percent. A smaller coefficient on the union membership parameter seems to suggest the reason for this relatively narrow range in wages. But it is the smaller variance in this factor due to the underlying high degree of industry segregation that really explains this result.

This same effect is nowhere more evident than in the top two occupation categories where in both cases the regression coefficients in the stratification module are insignificant thus yielding a manifest earnings range of zero associated with these factors. The nearly 50 percent total wage differential in occupation stratum 12-14 appears to be solely due to an ad conjunctum analysis of after-tax profits and capital/labor ratios while the smaller 28 percent differential in

TABLE 6.3

WAGE INTERVALS DUE TO STRATIFICATION AND
INDUSTRY FACTORS, BY OCCUPATION STRATUM
WHITE FEMALES

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval	
	W	Annual W	%	$	%
1-3					
$-Z_S^* + UN + Z_I^*$	$2.11	$4389	21.22%	$ .62	41.54%
$-Z_S^* + UN$	2.11	4389	21.22	.62	41.54
$\bar{W}$	1.74	3619	--		
$+Z_S^* - UN$	1.44	2995	-14.36		
$+Z_S^* - UN - Z_I^*$	1.44	2995	-14.36		
5					
$-Z_S^* + UN + Z_I^*$	2.47	5138	22.69	.87	54.63
$-Z_S^* + UN$	2.15	4472	6.96	.24	12.56
$\bar{W}$	2.01	4181	--		
$+Z_S^* - UN$	1.91	3973	-5.00		
$+Z_S^* - UN - Z_I^*$	1.59	3307	-20.65		
6-9					
$-Z_S^* + UN + Z_I^*$	2.14	4451	16.30	.56	35.44
$-Z_S^* + UN$	2.03	4222	10.32	.34	20.11
$\bar{W}$	1.84	3827	--		
$+Z_S^* - UN$	1.69	3515	-8.15		
$+Z_S^* - UN - Z_I^*$	1.58	3286	-14.13		

TABLE 6.3 (Continued)

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval	
	W	Annual W	%	$	%
12-14					
$-Z^*_S + UN + Z^*_I$	$2.87	$5970	22.07%	$ .95	49.63%
$-Z^*_S + UN$	2.36	4909	--	--	--
$\bar{W}$	2.36	4909	--		
$+Z^*_S - UN$	2.36	4909	--		
$+Z^*_S - UN - Z^*_I$	1.92	3994	-18.42		
15-17					
$-Z^*_S + UN + Z^*_I$	3.18	6614	12.35	.70	28.22
$-Z^*_S + UN$	2.83	5886	--	--	--
$\bar{W}$	2.83	5886	--		
$+Z^*_S - UN$	2.83	5886	--		
$+Z^*_S - UN - Z^*_I$	2.48	5158	-12.38		
All Strata					
$-Z^*_S + UN + Z^*_I$	2.59	5387	26.01	.96	58.22
$-Z^*_S + UN$	2.36	4909	15.12	.49	26.20
$\bar{W}$	2.05	4264	--		
$+Z^*_S - UN$	1.87	3890	-8.78		
$+Z^*_S - UN - Z^*_I$	1.63	3390	-20.36		

the professionals category appears purely as the result of variance in concentration. Labor supply imperfections not specified in the regressions, such as those used to explain the white male wage differential, are probably responsible for permitting the labor demand variables to have such a significant impact on the estimated earnings gap. Again it should be noted that the smallest wage interval is among the professional class while large differentials permeate the rest of the occupation strata.

In turning to the cross occupation estimates, we find a total wage differential (in percentage terms) not significantly different from that of black men. In this case the total differential is equal to $.96 an hour or 58.2 percent. A little less than half of this differential is associated with the STRAT module while the remainder is due, again as with black men, to a linear combination of after-tax profits, capital/labor ratios, and government demand. The overall wage interval runs from $1.63, just barely above the 1967 prevailing minimum wage, to a high of $2.59 an hour for women who gain access to industries or occupations characterized by a "permissive economic environment." In explaining these intra-group differentials we might rely on the same hypotheses we posited for white and black men and add the theory concerning different utility functions for women in different objective situations that we outlined in Chapter V.[14]

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[14]See Chapter V, fn. 35, p. 205.

Black Females — The extraordinarily large wage differentials found for black men are repeated for black women, with the exception that in occupation stratum 6-9 the earnings gap is even larger. (See Table 6.4) Being in a permissive economic environment can mean as much as $1.17 improvement over those who are not as fortunate, but given the very narrow range of opportunities for black women, even a "permissive economic environment" leaves virtually all of the workers in the first three occupation strata with estimated annual earnings below $5,000. In each of these cases, the largest part of the overall differential is due to stratification factors with union membership significant in every regression.

An evaluation of the pooled strata equation turns out to yield an earnings range which is almost identical in percentage terms to those found for the other two minority groups, although in this case a greater proportion of the total differential is associated with the stratification factors. Only concentration is significant in the industry module and at best variance in this measure adds $.15 to the $.82 differential. Table 6.5 demonstrates the near identical percentage differentials for the three minority groups. This striking similarity in the overall earnings differential is in sharp contrast to the much smaller interval associated with differences in industry and stratification factors for white men. Clearly the minority groups have something in common which they do not share with the dominant group in the labor force and it is far from their advantage.

TABLE 6.4

WAGE INTERVALS DUE TO STRATIFICATION AND
INDUSTRY FACTORS, BY OCCUPATION STRATUM
BLACK FEMALES

Occupation	Deviations from $\bar{W}$			Total Earnings Intervals	
Stratum	W	Annual W	%	$	%
1-3					
$-Z_S^* + UN + Z_I^*$	$1.79	$3723	31.95%	$ .75	72.47%
$-Z_S^* + UN$	1.71	3557	25.73	.58	51.32
$\bar{W}$	1.36	2829	--		
$+Z_S^* - UN$	1.13	2350	-16.91		
$+Z_S^* - UN - Z_I^*$	1.04	2163	-23.50		
5					
$-Z_S^* + UN + Z_I^*$	2.36	4909	26.88	.97	69.78
$-Z_S^* + UN$	2.21	4597	18.81	.68	44.44
$\bar{W}$	1.86	3869	--		
$+Z_S^* - UN$	1.53	3182	-17.74		
$+Z_S^* - UN - Z_I^*$	1.39	2891	-25.26		
6-9					
$-Z_S^* + UN + Z_I^*$	2.36	4909	37.20	1.17	98.31
$-Z_S^* + UN$	2.17	4514	26.16	.80	58.39
$\bar{W}$	1.72	3578	--		
$+Z_S^* - UN$	1.37	2850	-20.34		
$+Z_S^* - UN - Z_I^*$	1.19	2475	-30.81		

TABLE 6.4 (Continued)

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Intervals	
	W	Annual W	%	$	%
12-14					
$-Z_S^* + UN + Z_I^*$					
$-Z_S^* + UN$					
$\bar{W}$	SAMPLE SIZE TOO SMALL FOR SIGNIFICANT RESULTS				
$+Z_S^* - UN$					
$+Z_S^* - UN - Z_I^*$					
15-17					
$-Z_S^* + UN + Z_I^*$					
$-Z_S^* + UN$					
$\bar{W}$	SAMPLE SIZE TOO SMALL FOR SIGNIFICANT RESULTS				
$+Z_S^* - UN$					
$+Z_S^* - UN - Z_I^*$					
All Strata					
$-Z_S^* + UN + Z_I^*$	$2.12	$4410	27.71%	$ .82	63.07%
$-Z_S^* + UN$	2.05	4264	23.49	.67	48.55
$\bar{W}$	1.66	3453	--		
$+Z_S^* - UN$	1.38	2870	-16.86		
$+Z_S^* - UN - Z_I^*$	1.30	2704	-21.68		

TABLE 6.5

POOLED OCCUPATION REGRESSION WAGE
INTERVAL ESTIMATES

Race-Sex Group	Dollar Differential	Percentage Differential
Black Males	$1.15	61.82%
White Females	.96	58.22
Black Females	.82	63.07
White Males	.68	21.93

Cross Race-Sex – The individual race-sex equations mask the

effect of "crowding" as the extent of segregation rises beyond some

point. Nowhere is this more true than among higher-skilled white

females where occupational segregation is so extensive that the measured

effect of the stratification module is zero. For this reason the

pooled race-sex equations must be evaluated to correctly estimate

the impact of the industry and stratification factors. The results

confirm a significant earnings effect in every occupation stratum and

for the labor force as a whole. (See Table 6.6)

This effect is by far the greatest in the low skilled occupa-

tions. The total estimated earnings range in occupation stratum 1-3

is a startling $3350 around an annual full-time mean of $4722.

Workers in a "permissive economic environment" earn 35 percent more

than the average wage for this group and more than twice (110%) the

wage earned by those in overcrowded unorganized competitive industries.

Minority segregation by industry and occupation, combined with union

TABLE 6.6

WAGE INTERVALS DUE TO STRATIFICATION AND
INDUSTRY FACTORS, BY OCCUPATION STRATUM
ALL RACE-SEX GROUPS

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval	
	W	Annual W	%	$	%
1-3					
$-Z_S^* + UN + Z_I^*$	$3.07	$6386	35.24%	$1.61	110.27%
$-Z_S^* + UN$	2.97	6178	30.83	1.41	90.38
$\bar{W}$	2.27	4722	--		
$+Z_S^* - UN$	1.56	3245	-31.27		
$+Z_S^* - UN - Z_I^*$	1.46	3037	-35.68		
5					
$-Z_S^* + UN + Z_I^*$	3.08	6406	24.19	1.21	64.70
$-Z_S^* + UN$	2.85	5928	14.91	.75	35.71
$\bar{W}$	2.48	5158	--		
$+Z_S^* - UN$	2.10	4368	-15.32		
$+Z_S^* - UN - Z_I^*$	1.87	3890	-24.59		
6-9					
$-Z_S^* + UN + Z_I^*$	3.36	6988	29.23	1.54	84.61
$-Z_S^* + UN$	3.36	6988	29.23	1.54	84.61
$\bar{W}$	2.60	5408	--		
$+Z_S^* - UN$	1.82	3786	-30.00		
$+Z_S^* - UN - Z_I^*$	1.82	3786	-30.00		

TABLE 6.6 (Continued)

Occupation Stratum	Deviations from $\bar{W}$			Total Earnings Interval	
	W	Annual W	%	$	%
12-14					
$-Z_S^* + UN + Z_I^*$	$3.90	$8112	18.54%	$1.13	40.79%
$-Z_S^* + UN$	3.58	7446	8.81	.50	16.23
$\bar{W}$	3.29	6843	--		
$+Z_S^* - UN$	3.08	6406	-6.38		
$+Z_S^* - UN - Z_I^*$	2.77	5762	-15.80		
15-17					
$-Z_S^* + UN + Z_I^*$	5.35	11128	15.55	1.43	36.47
$-Z_S^* + UN$	5.01	10420	8.20	.76	17.88
$\bar{W}$	4.63	9630	--		
$+Z_S^* - UN$	4.25	8840	-8.20		
$+Z_S^* - UN - Z_I^*$	3.92	8154	-15.55		
All Strata					
$-Z_S^* + UN + Z_I^*$	3.67	7634	23.98	1.37	59.56
$-Z_S^* + UN$	3.42	7114	15.54	.86	33.59
$\bar{W}$	2.96	6157	--		
$+Z_S^* - UN$	2.56	5325	-13.51		
$+Z_S^* - UN - Z_I^*$	2.30	4784	-22.29		

membership, is responsible for a $1.41 earnings differential while

concentration adds another twenty cents to the overall range. In

annual terms the wage interval runs from $3037 to $6386 with human

capital evaluated at the occ group means. The overall 110.27 percent

wage interval compares with 72-76 percent intervals for black males

and females and 42-46 percent for white men and women suggesting a

strong racial and sexual component in the industry and occupation

distribution of low-skilled workers.

In occupation stratum 5 this "discrimination" component appears

less pronounced as the pooled percentage earnings differential falls

within the range of the separate estimates for each race-sex group.

Overall there is a $1.21 wage interval around a mean of $2.48. A

little more than half (35.7%) of the total interval (64.7%) is produced

by the STRAT module while the remaining is due to a linear combination

of concentration, after-tax profits, and capital/labor ratios. On an

annual basis the estimated interval is more than $2500 running from

$3890 to $6406.

Turning to occupation stratum 6-9 we once again find an

indication of the massive effect of industry and occupational discrimi-

nation. In none of the individual race-sex equations were any of the

industry and occupation segregation variables significant (with the

exception of union membership). But in the pooled regression three

of these factors are significant and powerful. Analyzed ad conjunctum,

%MININD, %MINOCC, and %BMOCC plus union membership are responsible

for an 85 percent earnings differential. Of this total range,

unionization is responsible for a little less than half ($.67) while
the other three crowding variables make up the remainder of the $1.54
interval. After controlling for these factors, differences in
industry structure have no additional effect on the wage range
suggesting "simple" but substantial crowding.

In the two higher skilled strata as well there is evidence of
sizable wage differences associated with the industry and stratification
factors. There is a $1.13 wage gap (41%) in occupation group 12-14
with an interval of $.50 associated with union membership combined
with a Z* evaluation of %MININD and %MINOCC. The remaining $.63 is
due to a linear combination of two industry variables: concentration
and after-tax profits. Even among professionals there is a 36.5
percent differential or an almost $3,000 annual salary interval after
controlling for human capital characteristics.[15] This is primarily
due to the sex-linked segmentation of the professional labor market.
About half of the interval in this stratum is due to the single
stratification variable %FMOCC while the remaining amount is associated
once again with a linear combination of concentration and after-tax
profits.

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[15] As has been the case throughout, we have evaluated these
equations assuming that SVP is a true human capital component, not a
function of industry or occupation segregation. Of course if we were
to interpret SVP as a stratification variable--for which there is a
good deal of justification--the wage interval would be much larger
in a number of these equations including the present one. Later when
we evaluate the effect of human capital, we shall assign the whole
weight of the SVP factor to this module, surely an overestimate of
the pure human capital effect.

Finally we come to the "grand pooled" regression for the whole labor force. Here we find for a human capital constant population a total range of $1.37 an hour or $2,850 a year on a full-time basis. This amounts to a 60 percent earnings differential between workers in a "permissive economic environment" and those, who for one reason or another, are consigned to industries which are on the "periphery" of the American industrial structure--industries which are non-unionized, impacted with minority groups, low profit, labor intensive, competitive, and lacking support in the form of government contracts.[16] A little more than half (33.6%) of the total interval is associated with labor supply restrictions while the rest is due to differences in industrial characteristics.[17] Such large differences

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[16]See Robert Averitt, The Dual Economy: The Dynamics of American Industry Structure (New York: W.W. Norton & Co., 1968), esp. Ch. 5.

[17]We should emphasize again that these are conservative estimates because of our evaluation technique. If we were to estimate the wage interval over the total range of the exogenous variables rather than at $\pm 1\sigma$ around their means, or if we were to use an ad seriatum measure of the interval, we would find a much larger earnings range due to the industry and stratification factors. Evaluating the "grand pooled" regression ad seriatum rather than ad conjunctum increases the total wage interval to $1.71 and the percentage differential to 83.5 percent. Instead of an annual income spread estimated at $2,850, the ad seriatum interval is $3,550, twenty-five percent larger. The correlation matrices for the relevant variables indicate the reason for the lower ad conjunctum estimate.

The zero-order correlation between %MININD and %MINOCC in the stratification module is .3887. The industry module correlation matrix has the following values:

	Concentrtn.	Aft/Tx Pr.	K/L Ratio	Gov't Demand
Concentration	1.0000	.3320	.4531	.0997
After-tax profits		1.0000	-.0872	-.0092
K/L			1.0000	.0533
Gov't Demand				1.0000

due to factors other than measured human capital surely calls into question Leonard Weiss's conclusion—and the assumption of most human capital theorists—that "The general picture is one of fairly efficiently working labor markets, even where substantial monopoly may exist."[18] What we have found in this extensive analysis is significant evidence of widespread mismatching between endogenous productivities and marginal products. Workers with substantially the same human capital attributes earn substantially different wages, much of this apparently related to industry and occupation "crowding" with variations in industrial structure and performance adding to the overall wage dispersion. The personal earnings distribution, we have shown, is to a far-reaching extent a function of institutional factors well beyond the purview, let alone control, of the individual worker.

The Relative Impact of Human Capital and Non-human Capital Factors

Before bringing this analysis to a close, there is one additional question that warrants our attention. We have estimated the earnings differentials associated with industry and stratification factors, but not those which are due to variation in human capital. How large are these in absolute terms and relative to the size of the Z_S^* and Z_I^* intervals?

To evaluate the human capital variables, we have resorted to an ad seriatum measure so as to avoid as much as possible the potential

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[18]Leonard Weiss, op. cit., p. 116.

error of underestimating the full impact of this module, again if

anything biasing our overall estimates in favor of the human capital

hypotheses. Each of the continuous human capital factors (schooling,

experience, and SVP) were evaluated at $\pm 1\sigma$ around their means while

the dichotomous variables (migration and training) were evaluated at

zero and one.[19] While the human capital factors were allowed to

vary in this way, the values for the stratification, industry, and

working conditions variables were set at their respective means. Two

ad seriatum estimates were made: one for differences in schooling

alone (ED-interval) and one for the complete human capital module

(HC-interval). These were then compared with the earnings differ-

entials associated with the industry and stratification factors

(Z-interval) by computing the ratio of the Z-interval to each of the

human capital ranges. The final numbers that result have no cardinal

meaning, but can be compared in ordinal fashion. The results are

found in Table 6.7.

The findings for white men are especially interesting. Although

the ranking of the occupation strata is imperfect because of overlapping

SVP scores, there still is a general ordinal trend in the skill

content of jobs as one moves from occupation group 1-3 to stratum 15-17.

Occ group 6-9 is the one major exception to this ranking primarily

because its SVP range is so broad (SVP=3.5-8.0). If we delete this

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[19] To simplify the analysis the evaluation was done only for
workers whose education was received outside of the south (i.e.
School-south = 0).

TABLE 6.7

Z/HC RATIOS BY OCCUPATION STRATA

Occupation Stratum	White Males				
	Z Interval	ED Interval[a]	HC Interval[b]	Z/ED	Z/HC
1-3	45.87%	13.84%	13.84%	3.31	3.31
5	23.82	21.83	28.61	1.09	.83
6-9	41.49	15.25	15.25	2.72	2.72
12-14	28.42	18.24	42.82	1.56	.66
15-17	12.40	42.62	114.86	.29	.11
All Strata	21.93	37.15	97.90	.59	.22
	Black Males				
1-3	75.80	20.84	55.32	3.64	1.37
5	74.85	15.01	26.06	4.99	2.87
6-9	49.23	16.08	35.21	3.06	1.40
12-14	66.83	14.74	50.58	4.53	1.32
15-17	na	na	na	na	na
All Strata	61.82	23.21	83.60	2.66	.74

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[a]The ED-interval is the earnings range expressed in percentage terms and estimated by evaluating each regression at mean values for every variable with the exception of education (years of school completed) which is evaluated at $\pm 1\sigma$ around its mean.

[b]The HC-interval is estimated _ad seriatum_ with all non-human capital variables evaluated at their means and the human capital factors evaluated at $\pm 1\sigma$ for continuous variables and zero and one for those that are dichotomous.

TABLE 6.7 (Continued)

Occupation Stratum	White Females				
	Z Interval	ED Interval	HC Interval	Z/ED	Z/HC
1-3	41.54%	15.53%	15.53%	2.67	2.67
5	54.63	11.58	11.58	4.72	4.72
6-9	35.44	--	--	--	--
12-14	49.63	19.26	39.11	2.58	1.27
15-17	28.22	59.71	59.71	.47	.47
All Strata	58.22	10.17	19.04	5.72	3.06
	Black Females				
1-3	72.47	23.24	52.60	3.12	1.38
5	69.78	30.35	51.44	2.30	1.36
6-9	98.31	16.71	16.71	5.88	5.88
12-14	na	na	na	na	na
15-17	na	na	na	na	na
All Strata	63.07	30.33	64.10	2.08	.98
	All Race-Sex Groups				
1-3	110.27	13.65	42.53	8.07	2.59
5	64.70	13.58	34.30	4.76	1.89
6-9	84.61	10.92	10.92	7.74	7.74
12-14	40.79	22.35	53.24	1.83	.77
15-17	36.47	44.57	110.20	.82	.33
All Strata	59.56	32.08	92.88	1.86	.64

special case, we find a monotonic increase in the size of the human

capital interval as we move from the lowest skilled occupations to the

professionals category. In occ stratum 1-3 the total HC-interval is

a mere 13.8 percent while it reaches almost 115 in the 15-17 group.

Roughly the opposite trend is seen in the earnings differentials

associated with industry and stratification factors (Z-interval).

The largest Z-interval is found in the lowest skilled category while

the smallest is found among the professionals. Consequently there is

a combined trend toward smaller Z/HC ratios as one moves to higher

occupation strata. In the lower skill groups the largest differences

in earnings are associated with differences in industry and occupational

attachment while differences in human capital begin to play a

relatively much more important role only on the higher rungs of the

skill hierarchy. In the lowest skilled occupations the earnings

interval due to non-human capital factors is more than _three_ times

as great as the range due to schooling, skill, and experience while

among professionals the size of the Z-interval is only 1/10 that

associated with human capital. Over all strata, those workers with

1σ more schooling, experience and SVP as well as geographical

mobility earn almost double (97.9%) the annual salary of workers

in similar industries who have 1σ less education, experience, and OJT

than average and who have never migrated since childhood. Compared

to this range, differences in industry and stratification variables

generate an earnings interval only 1/5 as large. Thus clearly for

the white male workforce as a whole, the primary factors determining

the distribution of earnings are related to human capital.
Nonetheless, for those "entrapped" in the less skilled sector,
industry and stratification factors are by far the more important
variables. As long as the entrapment continues, increases in human
capital will have little realized value.

Among black males the results are more ambiguous. There does
not appear to be any clear-cut trend in the size of the human capital
induced wage intervals over the range of occupations nor is there a
trend in the Z/HC ratios. While black men have relatively larger
earnings differentials associated with industry and stratification
factors, their HC-intervals are correspondingly larger leaving
relatively smaller Z/HC ratios than white men in occupation strata
1-3 and 6-9. On the other hand no single stratum ratio is below
unity suggesting that even in the relatively skilled strata the
non-human capital factors play a substantial role in wage determination.
The Z/HC ratio of .74 across strata discloses that both human capital
and institutional factors are each of critical importance.

For white women the non-human capital factors clearly dominate
the picture with a possible exception in the professional strata.
The human capital induced intervals are universally small in the
first three occupation groups and in fact in the 6-9 stratum human
capital differences have absolutely no effect on wage differentials
at all. All explained variance in these earnings are a function of
industry and occupational attachment, the Z/HC ratio being mathe-
matically undefined. Finally for all strata combined, the industry

and stratification factors measured _ad conjunctum_ are more than
three times more powerful than the human capital variables measured
ad seriatum. Thus we move to the very opposite of the continuum from
white men, suggesting that human capital differences are relatively
insignificant in determining the female personal distribution of
earnings while non-human capital factors dominate the field.

The results for black women are similar to those of black men
with the exception of occupation group 6-9. The human capital
intervals are of generally the same magnitude as the Z-intervals
in each of the individual occupation groups and across all strata.
Again it appears that both human capital factors on the one hand and
industry and stratification factors on the other play important roles
in the wage determination process. Changes in either set of factors
can be expected to have a substantial impact on estimated earnings.

In concluding we can turn to the results for the whole labor
force taken together. Here we find general _trends_ which parallel
those for white men, but _levels_ that are much closer to those found
for each of the minority groups. With the exception of the non-
comparable 6-9 strata, there is a monotonic downward trend in the
z-interval accompanied by a less regular upward trend in the impact
of the human capital module. Together they produce a concise
picture of the relative impact of the two sets of factors. Among
the least skilled workers in the economy, industry and stratification
factors produce an earnings differential 2.6 times the size of the
human capital interval. This ratio falls (with the obvious exception

of occ group 6-9) until it reaches .33 among the highest skilled

occupations. Again this leads us to the conclusion that human

capital factors are of substantial import but primarily only in the

higher skilled strata. For the rest of the workforce, institutional

and stratification factors are unambiguously important as independent,

and to a great extent primary, determinants of the personal earnings

distribution.

For the labor force as a whole, taking into account the relative

population size in each strata, a comparison of the Z and HC

intervals in the "grand pooled" regression suggests that the estimated

impact of the industry and stratification modules is about two-thirds

the size of the effect of the human capital module. Both are important

with human capital having a slight edge.[20] Nonetheless the massive

earnings differentials associated with (1) industry and occupation

crowding (2) differences in industry characteristics and

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[20]It should be emphasized that the range over which the human
capital factors are allowed to vary is by no means narrow. In the
"grand pooled" regression, the 93 percent earnings differential is
the total interval between two workers who have the following human
capital characteristics

+HC-interval	-HC-interval
School = 13.68 years (Junior College)	School = 7.86 years (Elementary School)
Institutional Training	No Institutional Training
Migrant	Non-migrant
40 years Experience	16 years Experience
SVP = 6.73 (2-4 years of OJT)	SVP = 2.97 (30 days-3 months OJT)

(3) miscellaneous factors concerning imperfections in the functioning of labor markets including pure discrimination, information barriers, and lock-in effects are obviously too large to ignore. Contemporary labor markets do not appear to be particularly efficient in matching workers with given endogenous productivity characteristics to jobs requiring these talents. After controlling for human capital as best we can, the evidence points overwhelmingly to the fundamental soundness of institutionalist and stratification hypotheses and provides substantial evidence of the superiority of the personal earnings distribution theory presented here.

The implications of these findings for manpower policy and particularly the low-wage workforce are far-reaching. It is to this matter that we next turn.

CHAPTER VII

CONCLUSIONS AND IMPLICATIONS

This study began with a relatively specific concern: to under-
stand why millions of full-time workers earn so little that their
families become "working poor" in terms of the Bureau of Labor
Statistic's budget for a "low standard of living" or worse yet the
Social Security Administration's poverty line.[1] Even more specifi-
cally our concern was to determine to what extent the low incomes of
the working poor are primarily the result of inadequate human capital
vs. the legacy of labor market imperfections.

Inevitably this relatively narrow problem gave way to much
broader questions about the determinants of earnings for the labor
force as a whole and finally prompted the construction of a general
distribution theory and the development of a comprehensive data set
to test it. While the results of our inquiry are, of course, not

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[1]In 1967, the Social Security Administration's "poverty line"
for a non-farm family of four was $3,410 while the Bureau of Labor
Statistic's "low standard of living" budget for an urban family of
four was $5,915. These figures can be found in U.S. Bureau of the
Census, Current Population Reports: Consumer Income, "Characteristics
of the Low-Income Population 1970" (Washington, D.C.: Gov't Printing
Office), Series P-60, No. 81, November 1971 Table M., p. 19 and U.S.
Department of Labor, Office of Information, "Three Standards of Living
for an Urban Family of Four Persons, Spring 1967" (Washington, D.C.:
Gov't Printing Office), March 1969.

absolutely incontrovertible, the evidence from the regression analysis seems more than sufficient to warrant some important conclusions about the American labor market and particularly about the market for less skilled labor. There are a number of policy implications in the manpower area that follow from this analysis.

It would be highly repetitive to recap all of the results presented in Chapters V and VI, but we can reiterate the major conclusions of those chapters and comment on some of the implications that follow from them. Obviously with the space available we can only outline some of these implications. A more in-depth analysis will have to wait for another day.

By far the most important conclusion of our analysis is that the American labor market is considerably inefficient in terms of matching what we have called "endogenous productivities" to marginal products or wages. Much of the labor force appears to be paid at rates not consonant with their measured human capital.[2] The result is "relative underemployment" of large segments of the labor force, particularly among minorities and less-skilled workers. Without altering an individual's human capital it is often possible, at least hypothetically, to increase that worker's earnings significantly by only "relocating"

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[2] We should stress the term "measured" once again, for it is almost certain that some forms of human capital have not been included in this analysis which partly account for some of the unexplained variance in earnings. In addition we should note that individual preferences have not been explicitly taken into account so that factors like "voluntary" immobility may also be responsible for some of the apparent "inefficiencies" in the labor market.

the worker from one industry or occupation to another. The wage

intervals we discovered for similarly qualified workers are large

enough to make the difference between poverty and a so-called adequate

family income. For example, when we hold human capital constant for

occupation group 1-3, where many of the working poor are found, we

find a wage range of $3037 to $6386, figures that bracket the poverty

line and the BLS "low standard of living" budget. In other occupation

strata we find large "human capital constant" wage intervals as well:

$2516 in occupation group 5, $3202 in group 6-9, $2350 in group 12-14,

and $2974 in the highest skill category. For the full-time workforce

as a whole, the wage range due to differential industry and

occupational attachment is $7634 vs. $4784. Thus a worker in the labor

force having "average" amounts of human capital but who gains access

to a "permissive economic environment" will earn almost 60 percent

more than a similarly qualified worker in a minority-crowded,

competitive, unorganized, low profit industry.

What is also clear from the analysis is that different segments

of the labor force face very different problems in the labor market.

In general, low incomes among white men are the result of inadequate

human capital, although imperfections in labor market information and

possibly the "lock-in" effects of prohibitively expensive geographical

relocation and non-vested seniority and pension rights appear to

promote significant wage differences among less skilled workers. Among

white women, on the other hand, measured differences in human capital

can explain practically none of the large wage differentials even among

relatively skilled strata. Our analysis indicates, in fact, that 95

percent of the difference in earnings between white women and white

men is due to factors _other_ than measured human capital. Much of the

total variance in our analysis is left unexplained, but that which

can be determined is disproportionately caused by imperfections in

the job market. The segmentation of the labor market into "male"

and "female" job slots seems to play a crucial role in wage determina-

tion. For black men and women, both the human capital and institutional

hypotheses are borne out in the wage determination process.

In theoretically specifying "imperfections" in the labor

market, emphasis was placed on the "crowding" hypothesis. As we

expected, the evidence for crowding is substantial although not

definitive. To prove crowding as a culprit in the wage determination

process, it would have been necessary to obtain actual estimates of

the labor supply and demand functions in each industry and occupation.

Unfortunately, for all practical purposes, this is an impossible task.

The minority employment variables we chose as proxies have the problem

of being substantially colinear with race and sex particularly because

sex-linked stratification is so pervasive. Nevertheless the "crowding"

variables were often significant _within_ individual race-sex groups

(including white men) after controlling for human capital and even

in a number of the cross race-sex equations after dummies for race and

sex were added. Both of these tests suggest that crowding has an

independent effect on earnings.[3] What is important to remember,

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[3] Data from the Census Bureau's _Consumer Income_ series provides

however, is that whether the STRAT module measures the specific form of discrimination known as "crowding" or some other form of discrimination is less important than the fact that something to do with race and sex is an extremely powerful determinant of personal income. It is perhaps the major reason for the lack of colinearity between endogenous productivity and earnings.

Insofar as there is evidence of "crowding" it was possible to divide its effect into "simple" and "complex" forms depending on whether in addition to the stratification factors differences in industry characteristics had an impact on the distribution of earnings. The compelling conclusion seems to be that "complex" crowding is the general rule throughout but particularly so for the minority groups. Simple crowding explained wage differentials for white men in occupation strata 1-3 and 6-9 while all black male, black female, and white female groups (excluding white women in occ group 1-3) were typified by significant industry as well as stratification variables. Employment in a permissive economic environment of extensive oligopoly, high profits, and capital intensity added significantly to the earnings

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corroborative evidence of "crowding" of white female labor. Since 1955 the ratio of full-time, full-year white female/white male wage and salary income has secularly fallen as the labor force participation rate of white women has risen. In 1955 the ratio was .644; by 1968 it had fallen to .586 and is continuing to fall. In the absence of crowding—and assuring no divergence in human capital or intensification of pure "sexist" attitudes—there is no reason to believe this ratio would fall. The increase in female supply should affect white male wages as well, if crowding is not operating. No other theory seems to explain this phenomenon as well. See U.S. Census Bureau, Current Population Reports—Consumer Income Series, P-60, No. 69, April 6, 1970, Table A-8, p. 86.

of minority group members, a finding in complete accord with traditional institutionalist theory.

One thing that becomes abundantly clear in the analysis, particularly in Chapter VI, is the dramatic change in the relative importance of the human capital and non-human capital factors as one moves from the low-skilled to the high-skilled occupation strata. Industry and stratification factors are universally dominant among the lower skilled strata while human capital takes on a larger and larger role as one proceeds up the occupational hierarchy. For the labor force in occupation group 1-3 we found that the industry and stratification factors produce an earnings differential 2.6 times the size of the wage differential due to differences in human capital. But among the highest skilled group the ratio falls to only .33 after a near secular decline through the whole occupational range. At the top of the hierarchy labor markets appear much more "efficient" in allocating workers according to their endogenous productivity characteristics.

There are a number of more specific findings that bear repeating. One of these is the statistical insignificance of institutional training as a determinant of earnings for every group with the exception of black males. For black men, the training variable was significant and relatively substantial in occupation groups 1-3 and 12-14 in addition to the cross-occupation regression. In no other regression was this true. This may be due to the poor measurement of this variable, or it might have some important content as we shall

later suggest.

On-the-job training, as measured by SVP, is an especially powerful variable in the higher occupation groups and across all occupation strata, but there remains great confusion as to what this finding actually proves. Because SVP is only obtained after access to a specific occupation is gained, it is difficult to treat it in like manner to the other variables in the human capital module. If occupational access is barred by discrimination or some other imperfection in the labor market, SVP may be better treated as a stratification variable and its effect counted here. On-the-job training is therefore of critical importance in wage determination, but it is difficult to suggest how social policy might be developed to deal with it based on our analysis.

Finally we should note that we have found practically no evidence of "compensatory" wage payments for physically demanding, unpleasant, or dangerous work. While our proxies for these factors are not especially well-measured, we often find a negative rather than positive sign on these variables. If we follow the signs on the coefficients, we note that there are a number of negative signs in the low-skill categories followed by insignificant coefficients in the middle and higher skill categories. The one positive sign we find is among relatively skilled white men. Only here is the compensatory theory borne out by the evidence. In the lower occupation strata differences in working conditions may be completely overshadowed by the effect of stratification while in the upper strata the true effect can be

measured because stratification plays a much weaker role. Alternatively it is possible that differences in ability and skill have not been held constant enough to pick up small, but nonetheless existing, "compensatory" effects.

Theories to Explain These Results

The overall picture then is one of a highly imperfect labor market stratified by race and sex. By no means is the human capital theory disproved or completely rejected, but the general theory of personal earnings developed here is clearly superior in its ability to describe the parameters of the earnings distribution. Yet the "theory" is primarily only a description even allowing for the analytic properties of the crowding hypothesis. The unanswered question is what dynamic is responsible for promoting such a labor market structure and then what can be done to alleviate its perverse distributional and allocational effects. We cannot hope to give a definitive answer to this gargantuan question, but we can attempt some brief conjecture.

We should note once again for the record that a strict human capital theorist will probably deny much of the evidence presented here and therefore possibly not see the need for an explanation at all. Arguing that the human capital module is misspecified and the data inadequate is one possible way to explain away the results found in this analysis. There is no measure of innate talent and admittedly there is an inadequate specification of interactions between human

capital variables. But this, in our opinion, cannot account for
the apparent wage intervals we have found associated with non-human
capital factors, particularly after loading the analysis in favor of
the human capital explanation at every turn. We feel that our analysis
clearly does demonstrate the existence of widespread imperfections
which cannot be explained away so simply. Assuming our results
generally correct we need to explain them.

One possible explanation comes from radical stratification theory.
The large wage differentials we have found associated with race and
sex can be interpreted as consistent with the "divide and conquer"
theory which is currently being developed.[4] At considerable risk of
oversimplifying and thereby vulgarizing radical theory, the argument
can be paraphrased. In order to keep the whole working class from
organizing en masse to overturn the capitalist order, the "ruling
class" has consciously devised institutions to prevent the development
of subjective class consciousness among all workers. Racism and
sexism have been deliberately instigated to affect divisions within
the working class along these lines. In its "vulgar" treatment,
radical stratification theory looks to conscious racist and sexist
hiring and promotion decisions by management as the major tools of the
"divide and conquer" strategy. More realistically, however, radical

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[4]For one version of the "divide and conquer" theory see David M.
Gordon, Richard C. Edwards, and Michael Reich, "Labor Market
Segmentation in American Capitalism," Conference on Labor Market
Segmentation, Harvard University, March 16-17, 1973 (mimeo). Also see,
Stephan Marglin, "What Do Bosses Do?" Review of Radical Political
Economics, Vol. 6, No. 2, Summer 1974.

theory points to the roles of social and cultural institutions,
particularly the schools and "bourgeois" family customs, in dividing
the working class.

Taken in this broader context, radical stratification theory,
we believe, has much to offer in producing an understanding of the
overall income and wealth distribution we experience in the United
States. It is clear that massive differences in schooling and in sex
roles are fostered in our society which end up segmenting the labor
force into different occupation strata.[5] Race, sex, and social class,
as we argued in the general stratification theory, can easily be seen
as the primary exogenous factors in determining the final distribution
of income.

But the problem in the present analysis is much narrower in at
least one respect. Here we have held human capital constant and
asked the question how much of the variance in earnings can be
explained by other factors. We therefore need a much more specific
theory which relates these human capital constant wage differences to
factors that operate in specific labor markets, not necessarily the
social milieu more broadly defined. One obvious answer to explain
wage differences is pure discrimination on the part of firms. Another

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[5]For an excellent treatment of this subject, see Samuel Bowles,
"Unequal Education and the Reproduction of the Social Division of
Labor," Review of Radical Political Economics, Vol. 3, No. 4, Fall-
Winter 1971 and Samuel Bowles, "Understanding Unequal Economic
Opportunity: The Role of Schooling, I.Q., and Family Economic Status,"
American Economic Review, May 1973.

is simply information imperfections which never get fully resolved.

But there is good reason to believe that such answers are indeed too simplistic. An adequate theory must do more than explain the existence of wage differentials which are not related to human capital. Such a theory must also be able to explain why industry-related wage intervals are largest in the lower-skilled strata while at the top of the occupational hierarchy the human capital elements dominate. Extending the brief analysis in Chapter VI, an eclectic theory can be suggested which meets these requirements. It is based on a combination of theories including (1) job competition (2) labor market search (3) quasi-fixed factor and (4) statistical discrimination all of which are placed within a specific historical context. A rigorous treatment of this eclectic model can most likely be demonstrated, but for the present we must be content with simply laying out the basic structure of the argument. One thing that is especially significant about the eclectic theory is that while it is consistent with the "crowding" hypothesis and radical stratification theory, it does not rely on a "conspiracy" theory of capitalist institutions.

As in Chapter VI assume a job competition model where job/wage slots are given exogenously, at least in the short run, and there are fixed costs of hiring and training labor. The fixed costs rise with increasing job complexity so that there is a general positive relationship between the degree of "fixity" and occupation strata. Also assume that information about potential employees is imperfect and involves procurement costs. Information on average group

characteristics, even if imprecise, is relatively inexpensive to
obtain while information about specific individuals is costly.

With these assumptions and the additional one that firms
attempt to minimize total labor cost in an attempt to maximize profit,
we can generate a theory fully consistent with most of our findings.
Firms will attempt to minimize the sum of direct payments to labor
plus search costs plus hiring and training costs. These costs are
not independent of each other for higher wage offers can reduce search
costs by increasing the supply of labor to the firm and greater search
effort can reduce training costs by providing a higher expected
probability of acquiring workers who can be quickly and efficiently
trained. Wherever the training requirements for a specific job are
minimal we can expect that the rational firm will find it unnecessary
to invest heavily in search, for recruitment "mistakes" do not force
the firm to incur large sunk costs. On the other hand, wherever
training requirements are substantial, the cost of a recruitment error
is considerable. Therefore we can expect that there will be a
positive relationship between the degree of fixity in a particular
occupation stratum and search costs. To reduce the risk of large
unprofitable sunk costs, firms will search intensively for recruits
destined for skilled positions while expending little search effort for
workers who are hired primarily to fill unskilled (low "fixity") slots.

In more specific terms, firms will investigate the individual
characteristics of their prospective skilled employees while using
rules of thumb or general search strategies to fill unskilled job

slots. In the latter case, many firms will resort to statistical selection of one sort or another using supposedly objectively perceived group characteristics in making hiring decisions about specific individuals.[6] While "rational" in the limited economic sense, such a strategy is obviously prejudicial by definition.

One important question, of course, is what group characteristics are used for screening. Here is where the historical context inevitably plays a crucial role. The social and cultural institutions and belief systems embedded in any society are marked by substantial inertia. Once firmly established for whatever reason, they tend to be passively, if not actively, perpetuated. Without reviewing American (or for that matter much of all Western European) history it seems hardly necessary to "prove" that both blacks and women have historically been relegated to disadvantaged positions in the labor force, blacks through involuntary servitude and racial segregation and women through family custom.[7] Through the years custom and habit have produced some objective differences in group characteristics as well as (and probably more importantly) induced lingering perceptions of differences which may have no basis in fact. Both of these no doubt have a substantial impact on recruitment patterns.

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[6]See Kenneth Arrow, "Some Models of Racial Discrimination," op. cit.

[7]This analysis obviously begs the real question: why did the racial and sexual institutions and beliefs develop in the first place. Here "divide and conquer" theory suggests one possibility.

In the context of our culture, statistical screening then works itself out in terms of racist and sexist hiring procedures, not necessarily out of an express desire to "divide and conquer" or out of a deep-seated commitment to white male domination of society (although both of these may be operating). Rather if firms have widespread beliefs about the expected probabilities of employee "success"-- whether these expectations be grounded in fact or not--the result will be stratification of the labor force.

To review, the lower the degree of fixity, the smaller the potential cost of a recruitment mistake which in turn leads to minimal search effort and a general tendency toward statistical discrimination as the firm's search technique. The end result inevitably is stratification of the labor force in the lower occupation strata. If a sufficient number of firms screen on the same character- istics, the result will be crowding and the development of large wage differentials between groups in the economy. Once the initial stratification has taken place, differential supply of on-the-job training (SVP) may tend to exacerbate these differences. Also once this system has been generated, it tends to be perpetuated. If the screening procedures seem to have "worked" in the past, they will tend to become rules of thumb to follow in the future. Thus even without pursuing a conscious policy of "divide and conquer," a private cost minimizing system will tend to perpetuate non-human capital linked stratification as long as labor market information is imperfect and costly to secure. In the absence of government intervention, the

"social costs" of stratification will continue to be borne by
minority members of the labor force. And these costs, as we have
amply shown, are often immense. Whatever private gain might come
from a "divide and conquer" policy if perpetrated may redound to the
"capitalists'" benefit even without their active participation. In
effect, then, a market system operating in an environment of
(1) substantial quasi-fixed costs for skilled labor (2) non-zero cost
information, and (3) a legacy of racist and sexist custom will tend to
produce a "meritocracy" at the top of the occupational hierarchy and
racial and sexual stratification at the bottom.

What's To Be Done?

The labor market we have uncovered is one involving large scale
inefficiencies if one defines efficiency by a colinear mapping of
endogenous productivity characteristics and earnings. Yet we have
also posited a theory that the "inefficiencies" may be due to the labor
market operating the best it can given the context of a supposedly free
market and limited information. If the market is to be moved toward
a more socially "efficient" and equitable allocation of labor, what
must be done?

Obviously a labor market which is segmented in such a complex
manner as we have discovered requires a multifaceted set of policies
to ensure equal opportunity in the labor force and reduce allocational
inefficiency. No single policy will be sufficient to redress the
stratification in the labor market. Without going into detail, we can

lay out a few areas in which we feel policy must be directed.

One obvious finding is that although labor market stratification is widespread, differences in human capital are still extremely important. Within each race-sex group increased human capital in the form of formal education, labor force experience, on-the-job training, and migration all pay off in terms of higher earnings. Yet there are great disparities that remain in the allocation of human capital between individuals, particularly on the basis of race and class. This has been amply demonstrated by other researchers.[8]

To redress the balance requires at a minimum equal educational opportunity if not compensatory educational programs for groups which have historically been at a competitive disadvantage. In order to ensure equal labor market opportunity may in fact require unequal educational opportunity, discriminating in favor of previously discriminated against minorities. Quota systems and direct application of affirmative action in college admissions, for example, are probably required. Other forms of human capital may be equalized by providing relocation allowances for those who can profit by moving from one area

[8]See for instance, Samuel Bowles, "Schooling and Inequality from Generation to Generation," Journal of Political Economy, May 1972; W. Lee Hansen and Burton Weisbrod, "The Distribution of Costs and Direct Benefits of Public Higher Education: The Case of California, Journal of Human Resources, Spring 1969; Stanley H. Masters, "The Effect of Family Income on Children's Education: Some Findings on Inequality of Opportunity," Journal of Human Resources, Spring 1969; James S. Coleman, et al., Equality of Educational Opportunity (Washington: U.S. Government Printing Office, 1966); Patricia Cayo Sexton, Education and Income (New York: Viking Press, 1964); and Samuel Bowles, "Towards Equality of Educational Opportunity?" Harvard Educational Review, Vol. 38, Winter 1968.

to another and providing incentives for firms to give on-the-job training to minority group members.[9]

But the primary implication of our analysis is that manipulation of <u>non-human capital factors</u> is also critical to addressing current labor market problems, particularly of the working poor. Insofar as direct discrimination is still widespread in the labor market, it is clear that equal employment opportunity legislation must be extended and forcefully implemented. As in education, affirmative action in employment is an important tool in promoting social efficiency in the labor market. More recent implementation of affirmative action may have already begun to excise the wage differentials between race-sex groups. Clearly such a direct approach to ending discrimination is warranted by the results presented in our analysis.

Beyond direct affirmative action, there seem to be a number of roles the government can play in regard to statistical discrimination. If, as we suspect, screening is often based on erroneous conjecture about group characteristics, the government can help to "correct the record." Such intervention in the market would not have the same powerful effect of direct action, but it no doubt should be in the government's policy tool-box. Where substantial discrimination is "objective," then the government must find the means for decreasing the private sector's cost of procuring individual job applicant

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[9]This latter policy suggestion should be qualified for according to the General Accounting Office, firms can take advantage of on-the-job training subsidies without providing much additional benefit to disadvantaged workers. See Chapter I, footnote 8.

information. This role could be played by a much more effective

public employment service which would have the funds and the

expertise to accurately screen individuals on the basis of relevant

job characteristics.[10] The current Employment Service has generally

failed in its attempt to bring low-skill workers and jobs together.[11]

More specific implications can be drawn from the analysis about

manpower training programs. We noted at the beginning of this inquiry

that most social scientists and government officials have been

disappointed with the performance of manpower programs in the United

States. In the present analysis we find additional evidence that

institutional vocational programs have failed to have much of an

impact on earnings (although we have no information on their effect

on securing employment). The "training" variable is significant only

for black males as far as the individual race-sex equations are con-

cerned. Training is never significant for white men nor either group

of women. This result caused some consternation for we originally

suspected that if any group should benefit from institutional training

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[10]See Richard Lester, _Manpower Planning in a Free Society_
(Princeton: Princeton University Press, 1966) and Alfred L. Green,
Manpower and the Public Employment Service in Europe (New York: New
York State Department of Labor, 1966).

[11]One new piece of evidence for this conclusion comes from a
recent study in the Boston labor market conducted by the Social Welfare
Regional Research Institute, Boston College. In virtually all of the
firms studied by SWRRI, the employment service was not considered a
reliable source for obtaining relatively less skilled labor and there-
fore was rarely contacted about job vacancies. Robert Hubbell and
Martha MacDonald, "A Study of Employee Recruitment in Boston," Social
Welfare Regional Research Institute, Boston College, Working Paper,
forthcoming.

it would be white men. But here we find only black men apparently gaining from these programs. One explanation, of course, is that the result is purely spurious, but there is an alternative that we prefer.

It has often been suggested that manpower training programs do little to increase the actual productivity of workers but play a primary role in the screening of recruits.[12] White males do not gain from this additional "screen" because they already are "screened into" the better occupations and industries by reason of their race and sex. For blacks, however, training plays the critical role of signaling to potential employers the special motivation that trainees may engender or appear to engender. In this case firms can use enrollment in a training program as a way of screening in a few black recruits while the normally operating racially-linked statistical discrimination screens out all others. If this is true, then institutional training is obviously an important "human capital" variable for black men, although its usefulness as a screening device might depreciate as the number of institutionally trained black workers increases. All of this is but conjecture at this point, but it makes some sense within the context of the general stratification theory underlying our analysis.[13]

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[12]See Ivar Berg, Education and Jobs: The Great Training Robbery (New York: Praeger, 1969).

[13]It has been suggested to me by several colleagues that institutional training may even be a negative credential for white men if employers see enrollment as an indication of labor market disadvantagement. A "good" worker should not need a vocational training program, might be the thinking of employers.

Finally we may conclude by mentioning the broadest implications

of our analysis. What we believe we ultimately have shown is that

the distribution of earnings in the United States is substantially

arbitrary with respect to human capital. A large part of earnings

differentials have been shown to be related to non-human capital

factors so that the overall distribution of earnings can be described

as "unfair" with equal human inputs being rewarded with vastly unequal

returns. Much of the justification for existing wage and income

differences attributed to marginal productivity theory thus pales

before this analysis even if one has accepted the questionable premise

that a just distribution of income is one based on marginal products.[14]

Imperfections are so extensive and their effect so deep that the

relationship between endogenous productivity and marginal product is

far from colinear.

If individual policies of systematically countering imperfections

in the labor market cannot assure a solution to the distribution

problem--which is very possibly the case--then it will probably be

required, at least in the short run, to resort to direct redistribution

of income via negative income taxes or other forms of income guarantee.

Such a redistribution would be far from perfect in redressing the

balance, but would be in general accord with the policy implications

that flow from the crowding hypothesis. Under a negative income tax,

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[14]See J.B. Clark for an early statement of the neoclassical
"just" wage doctrine. John Bates Clark, The Distribution of Wealth
(New York: MacMillan, 1900), esp. Chapter 1 or Milton Friedman, Price
Theory: A Provisional Text (Chicago, Aldine, 1967), Ch. 10.

income would be transferred from those who have higher earnings in part due to segregation to those who have been the victims of a stratified labor market. In this case direct redistribution is a surrogate for what would actually occur in the labor market if barriers to mobility were reduced.

Thus the policy implications of our findings are extremely far-reaching. They demand that policy-makers understand the need for wide-ranging intervention in the economy at the micro level in order to move toward a more "efficient" and distributionally fair labor market. Direct attacks on the structure of labor markets will often be much more effective particularly for lower-skilled workers than attempts to remedy all problems through individualistic human capital policy. All of this, of course, abstracts from even broader questions of the control of the economy at large . . . but this is a question to which I hope to devote my future work.

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