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ABSTRACT

This analysis of income changes is based on retrospective life history data collected from white and black men, 30-39 years old in 1968. Educational level is shown to be the most important determinant of initial income for both blacks and whites, but the relationship is weaker for whites than for blacks. Ten years later, education shows a stronger relation to growth in income for whites than for blacks. The differential impact of levels of education and other background resources on initial income and income 10 years later is examined. For initial income, black resources are more efficacious than those of whites, but the greater average resource levels of whites creates an initial income difference in favor of whites. Ten years later, the efficacy of white background resources for income growth is greater than that for blacks. Intervening events and experiences, whose efficacy favors blacks, keep the income gap from becoming even wider. A comparison of this income analysis with a previous analysis of occupational status suggests that whites may be using their resources to obtain jobs with a high status, with the expectation that the job status will in the long run bring high income, while blacks are doing the opposite. Testing of the effectiveness of such a strategy (if it is a conscious strategy) indicates that it is effective for whites, while it would be much less so for blacks. A related study is available as VT 015 019. (Author)

Center for Social Organization of Schools

REPORT No. 122

DECEMBER, 1971

INCOME CHANGES DURING THE FIRST TEN YEARS OF OCCUPATIONAL EXPERIENCE: A COMPARISON OF BLACKS AND WHITES

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INTRODUCTORY STATEMENT

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through five programs to achieve its objectives. The Academic Games program has developed simulation games for use in the classroom. It is evaluating the effects of games on student learning and studying how games can improve interpersonal relations in the schools. The Social Accounts program is examining how a student's education affects his actual occupational attainment, and how education results in different vocational outcomes for blacks and whites. The Talents and Competencies program is studying the effects of educational experience on a wide range of human talents, competencies, and personal dispositions in order to formulate--and research--important educational goals other than traditional academic achievement. The School Organization program is currently concerned with the effects of student participation in social and educational decision-making, the structure of competition and cooperation, formal reward systems, effects of school quality, and the development of information systems for secondary schools. The Careers and Curricula program bases its work upon a theory of career development. It has developed a self-administered vocational guidance device to promote vocational development and to foster satisfying curricular decisions for high school, college, and adult populations.

This report, prepared by the Social Accounts program, examines income changes for a cohort of black and white men over a ten-year period.

Acknowledgment

This paper is part of a research program in Social Accounts initiated by Peter H. Rossi and James S. Coleman. Authorship on this paper is misleading since it is a group effort. I am especially indebted to James S. Coleman for his comments and suggestions and to Page Clark for assistance in processing these data.

Abstract

This paper presents an analysis of income changes based on retrospective life history data collected from white and black men, 30-39 years old in 1968.

Educational level is found to be the most important determinant of initial income for both blacks and whites, but the relationship is weaker for whites than for blacks. Ten years later, education shows a stronger relation to growth in income for whites than for blacks.

The differential impact of levels of education and other background resources on initial income and income ten years later is examined by partitioning the differences into three components -- differences in levels, differences in efficacy, and unexplained differences. For initial income, black resources are more efficacious than those of whites, but the greater average resource levels of whites creates an initial income difference in favor of whites. Ten years later, the efficacy of white background resources for income growth is greater than that for blacks. Intervening events and experiences, whose efficacy favors blacks, keeps the income gap from becoming even wider.

A comparison of this income analysis with a previous analysis of occupational status suggests that whites may be using their resources to obtain jobs with a high status, with the expectation that the job status will in the long run bring high income, while blacks are doing the opposite. Testing of the effectiveness of such a strategy (if it is a conscious strategy) indicates that it is effective for whites, while it would be much less so for blacks.

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INCOME CHANGES DURING THE FIRST TEN YEARS OF OCCUPATIONAL EXPERIENCE: A COMPARISON OF BLACKS AND WHITES

Introduction

A recent analysis (Coleman, Blum and Sørensen, 1970), focused on the occupational achievement of black and white men during the first ten years of occupational experience after last leaving full-time education. That paper used the status of the first and last full-time jobs during that ten-year period as a measure of occupational achievement. Comparing the careers of black and white men, the analysis highlighted differences in both the levels of resources which whites and blacks bring to the job, and the efficacy of those resources in achieving occupational status.

Emphasizing occupational status allowed only one dimension of occupational achievement to be examined. The present analysis will examine another dimension of occupational achievement -- income. Whenever possible, the present work will parallel the previous analysis, so that any differences between the determinants of occupational status and income from the job can be identified.

As in the previous analysis, the approach to the study of an individual's occupational achievement is to select, as a starting point, the first civilian full-time job after last full-time education. It is

evident that any such starting point must to some degree obscure reality, but the principal attention of this paper is on events which intervene between this starting point and a point ten years later. During this period, military service, marriage, geographical relocation and other events can occur (or fail to occur) at different times for different individuals. Such events can modify the labor force experience in many ways. The present analysis will examine some of these events and experiences and look at the degree to which they alter an individual's income.

The initial income is defined as the income that the individual received during the first year of full-time work in the ten-year period examined. We define later income as the income the individual received on the job he held ten years after his first job. Operationally, we use the income of the year which brackets that point in his occupational experience.[1]

During the first year of work after last leaving full-time education, the average white respondent had an income of $3134 and the average black had an income of $2661 -- a difference of $473 between the two groups.[2] During the tenth year, the average white earned $6699 and the average black $4810 -- a difference of $1889. These figures raise

two main questions -- what led to the initial difference and, more important, what led to the increased gap between the two groups in the course of ten years?

To answer these questions, we need to examine various factors that could be responsible for these differences. Figure 1 is a diagram of the variables and events that are examined in the analysis. The classes of variables in this figure can be summarized as follows:

(A) Background variables characterizing the respondent's family of orientation;

(B) Variables, including educational attainment, that characterize the individual prior to his first full-time job after last leaving full-time education;

(C) Income of the first full-time job after last full-time education;

(D) Factors that intervene in the ten years between the first full-time job and the later job. These factors include events in the occupational, residential, marital and educational spheres;

(E) Income of the later job (as defined above).

Figure 1 About Here

At the far right of Figure 1 is the end point of the analysis: later income. The arrow marked "10 years" leads from the first full-time job to the later job. The five arrows marked 6, 7, 8, 9 and 10 represent the clusters of events that occur during the decade and which we assume have some impact on occupational achievement. Preceding the first full-time job are three additional arrows (marked 3, 4, and 5). Arrow 5 represents the direct effect of educational attainment on the income of the later job. Arrows 3 and 4 show the direct effects of education and other selected experiences on the income of the first year. Arrows 1 and 2 represent the direct effect of family background characteristics on the first job and on the later job apart from their effects on educational attainment and on the events represented by arrows 6, 7, 8, 9, and 10.

In the first portion of the analysis, the concern will be to determine the effects of variables of types (A) and (B) on initial income. In the later portion, the emphasis is on change or growth of income over the ten-year period rather than in the determinants of income per se. In this portion of the analysis, variables of types (C) and (D) are also important.

Results

Effects of Characteristics and Activities on Income of First Year After Last Full-Time Education

Table 1 lists the background characteristics and events measured in this study that occurred prior to the individual's first full-time job.[3] In addition to the mean values of these variables for both blacks and whites, the zero-order correlations with initial income and initial occupational status are listed. The latter are reproduced from the previous occupational status analysis for comparative purposes. Table 1 shows that, in the case of initial income, the general pattern for blacks and whites is similar. However, some differences do exist. The correlation of father's education with income is higher for blacks than whites, and generally higher than the comparable correlation with status.[4] Exactly the reverse is true for father's occupational status.

Table 1 About Here

The correlation between a respondent's initial income and the way in which he obtained his first job is higher for blacks than for whites, the

reverse of the pattern for status. For both blacks and whites, those jobs obtained through family connections tend to pay less and to have less status than those obtained in other ways. However, the black-white pattern is alike for the relation of military service to status and income. Military experience prior to first job is more highly related to income for blacks than for whites, as is true for occupational status.

Marriage prior to first job, practice of birth control prior to first job, and wife's participation in the labor force are more highly related to income for whites than for blacks, which is also true for occupational status. These variables reflect the fact that whites are slightly older than blacks at the time of their first full-time job, i.e. the variables are surrogates for age.[5] In contrast, wife's education is more highly correlated with husband's income for blacks than for whites, again the same pattern found for occupational status.

Finally, the correlation between income and the respondent's education (the largest in the table) is higher for blacks than for whites. This is the reverse of what is observed in the correlations with occupational status. The data suggest that whites and blacks may make different types of decisions in selecting a first job (with whites stressing status

and blacks stressing income); or, alternatively, that employers may use different considerations for blacks than for whites just entering the labor force.

Two additional characteristics, region and remuneration-in-kind, have been considered in relation to the first year's income as corrections for observed dollar income. First, since wage differences occur in different parts of the country, the respondent's North-South location is taken into account.[6] In the zero-order correlations with income of the first year, the impact of this regional difference is much greater for blacks than for whites (.358 vs. .194). For blacks, this is the second largest correlation in the table. In addition, food, clothing and other types of remuneration-in-kind are reported by some individuals as being part of their wages during the first year. The number of months during the first year in which the respondent received remuneration-in-kind is consequently included as a variable. Just as region of the country accounts for broad wage differentials, remuneration-in-kind can account for some of the dollar income differences between individuals.[7]

One way of examining the process through which income of the first year is established, and the differences in this process for blacks and whites, is to look at the coefficients from a regression of income on some

of the variables discussed above. The regression coefficients are presented in Table 2.[8] Several variables from Table 1 have been omitted to maintain comparability with the earlier analysis of occupational status. In that analysis, they were excluded after initial regressions because they showed little relation to occupational status. Here, also, including them did not appreciably affect the analysis.[9]

Table 2 About Here

The regression of initial income on these variables indicates that education outweighs other characteristics in determining initial income for both blacks and whites. However, and bearing out the indications from zero-order correlations, it is somewhat more important for blacks than for whites. The increment of income associated with a unit increase in education for blacks is $295 compared to $250 for whites, a difference of $45.

When occupational status, rather than income, was regressed on this same set of background characteristics and events prior to the first job, these characteristics and events explained 28.1% of the variance in

status for whites and 21.5% for blacks.[10] In this analysis, they explain 24.8% of the variance in income for whites (20.1% when region and remuneration-in-kind are not included) and 36.3% of the variance in income for blacks (31.0% when region and remuneration-in-kind are not included). In other words, the model we have postulated shows a better fit for whites in the analysis of occupational status and a better fit for blacks in the analysis of initial income. These data, then, continue to suggest the possibility that whites may be initially using their background characteristics and especially their education to obtain occupational status, while blacks initially use these characteristics to obtain income.

As stated previously, these results of the analyses of initial occupational status and of initial income imply that blacks and whites may be using different labor-market strategies or that employers are differentiating between the two groups in specific ways. In all likelihood, both factors are operative. Looked at from the individual's level, whites may be maximizing initial status with the hope that long-range economic returns will follow, and blacks may be maximizing income. Looked at from the employer's perspective, it may be that the type of commitments or rewards he is willing to give differs between blacks and whites. And it is always possible that "blacks" and "whites" here are merely indicators

of general levels of labor force participation that differ for the two groups. The extent to which different employment strategies exist can only be conjectured here. The extent to which they are successful if they exist (for individuals), within the limits of the ten years of experience discussed here, is a question that can be partly answered by later sections of this paper.

Aside from the coefficients for education, some of the other components of Table 2 should be examined. As was the case with occupational status, military service before the first job is more important in determining initial income for blacks than it is for whites. For both blacks and whites, however, the impact of this experience on income is important, bringing an income increment of $706 for whites and $959 for blacks. On the other hand, marriage prior to the first job has a greater payoff for whites. Although being married adds to the initial income for both groups, the amount is substantial ($441) and statistically significant for whites, while it is not statistically significant (i.e., possibly due to chance) for blacks.

As expected, the effect on income of living in the North is large and statistically significant for both groups. The effect, however, is greater for blacks ($631) than for whites ($488). This difference (which

would appear even greater as a percentage of income, since black incomes are lower) may be due to the greater racial discrimination in wage scales in the South.

What Differences Do Levels of Background Resources Make and What Differences Do Processes Make in Initial Income?

The previous discussion suggests that the observed difference in initial income between blacks and whites is due to (1) the differences in levels of background resources held by the two groups, and (2) the differential effects of these resources on income. In a previous paper (Coleman and Blum, 1971), a method was developed to evaluate the difference that levels of characteristics make in initial status and the difference that the differential efficacy of these characteristics makes. An intuitive grasp of this method, which we will apply to initial income, can be obtained by imagining a set of hypothetical experiments.

Suppose, first, that a white at the time of obtaining his first job had the same background characteristics as the average black (in this case, as given in the means column for blacks in Table 1). If we insert these mean values into the regression equation for whites, this would

generate an expected income for the first year. If this is higher than the actual income of the average black (i.e., with the same levels of resources), then the efficacy of the resources is greater for whites than blacks. If it is lower, the efficacy is greater for blacks than for whites. The actual comparison is a slight modification of this, but the above hypothetical experiment gives the idea. Another comparison, between the income generated by this equation (which used whites' coefficients and blacks' average resources), and the actual income of the average white, gives an estimate of the importance of differences in levels of resources held by blacks and whites.[11]

A similar hypothetical experiment could be carried out by assuming a black with background resources identical to those of the average white and inserting these values into the regression equation for blacks. Comparing this hypothetical income to the actual income of the average white gives some indication of the relative efficacy of these resources for blacks and whites. Comparing it to the actual income of the average black gives another indication of the importance of differences in levels of resources.[12]

There is, in addition, a component of the overall income difference that is due neither to the different levels of measured resources nor to

the different efficacy of these resources. This is the difference in income that is unexplained either by different levels of the resources or different efficacy, but is instead due to unmeasured variables.

The equations given below, taken from Appendix B in which the procedure is outlined in detail, can be used to perform these hypothetical experiments.

$$\Delta\bar{y} \text{ (levels)} = \tfrac{1}{2} \sum_{i=1}^{n} (b_{iw} + b_{ib}) (\bar{x}_{iw} - \bar{x}_{ib}) \quad (1)$$

$$\Delta\bar{y} \text{ (effects)} = \tfrac{1}{2} \sum_{i=1}^{n} (b_{iw} - b_{ib}) (s_{iw} + s_{ib}) \quad (2)$$

$$\Delta\bar{y} \text{ (unexplained)} = \tfrac{1}{2} \sum_{i=0}^{n} (b_{iw} - b_{ib}) (\bar{x}_{iw} - s_{iw} + \bar{x}_{ib} - s_{ib}) \quad (3)$$

Table 3 summarizes the results of these experiments. The results are presented in a form that corresponds more closely to the intuitive description given above. Columns 3 and 4 of the table show, for example, the contributions to income among blacks for individuals having characteristics of the average white and characteristics of the average black. In column 3, for a black with the educational level of the average white, education adds $1159 to his income (compared to someone of zero education). If he has the education of the average black this education adds $902

(column 4). This gives an estimate of $257 as the difference in income caused by the difference in levels of education for blacks and whites. For the average white, using the white equation (column 1), education increases his income by $983. But if he had the education of the average black, and were subject to the same processes as the average white, this education would add $765 (column 2), compared to someone with zero education. This gives a second estimate of the importance for income of differences in levels of educational attainment for whites and blacks, an estimate of $218. The average of these two estimates is $237 which is an overall measure of the income effect of the greater levels of educational attainment for whites than for blacks.[13]

Table 3 About Here

Columns 5 and 6 can be used to compare the efficacy of education in obtaining income for blacks and for whites. Using the white coefficient for education (column 5) times the average standard deviation of education gives a measure of the efficacy of education for whites. Similarly, the black coefficient (column 6) times the average standard deviation gives the efficacy of education for blacks. The difference between these

numbers, or $73, is a measure of the difference in efficacy of education for income, which in this case is greater for blacks.

Using the numbers in columns 1 through 6 from Table 3 in equation (3) shows the amount of income difference that is not explained either by differences in levels of the independent variables or by differences in efficacy. Calculating this unexplained difference as well as Δy (levels) and Δy (effects) by using equations (1), (2), and (3) gives the tabulation shown in Table 4.

Table 4 About Here

Table 4 shows that whites have an income $573 greater than that of blacks due to different levels of resources, but that for blacks the efficacy of resources is greater ($183) than for whites. We originally observed a difference of $473 between the average income earned during the first year of the first full-time job by the two groups. The calculations in Table 4 indicate that if it were merely a matter of the levels of resources with which the average black and white enter the labor market, the difference would be $573, while if it were merely a matter

of efficacy of resources, the difference would be $183 in the other direction. Finally, there is an unexplained difference of $83 in the direction of higher white income.

A similar calculation had been performed previously (Coleman, Blum, and Sørensen, 1970) for differences in occupational status of the first job. It was found that 58% of the difference between the two groups was due to differences in background resources, 34% to differences in the efficacy of those characteristics, and 8% unexplained; that is, both levels and efficacy were greater for whites. In this analysis, levels account for 121% of the observed difference, efficacy -39% and 18% is unexplained.[14]

Comparing the two analyses suggests that blacks have a more difficult time in converting background resources into occupational status than they do into income. The fact that blacks are considerably less well off in occupational status than in income compared to whites has been noted in another analysis using this set of data (Blum and Coleman, 1970). What is surprising here is that the efficacy of these processes for income is greater for blacks than for whites, a result that appears generally out of accord with common knowledge in this area. Does this imply that whites

are concerned principally with the status of their first job, while blacks are concerned with its income? The results certainly suggest this. However, it is important to recall that this analysis has considered only the first job after full-time education, and not what happens later. What happens in that later period will shed light on these questions.

Changes in Income Between the First Year and the Tenth Year After Obtaining the First Full-Time Job

Ten years after they enter the labor force, the mean income of whites is $6699, and that of blacks is $4810. Both groups, then, increase their income substantially. However, the increase for whites is much greater than that for blacks (in dollar terms, a difference of $3565 compared to $2149; in percentage terms, 214% of starting income compared to 181%). The purpose of the present section is to isolate those factors -- prior to the first job and in the intervening period -- which account for the differential gain between the two groups. Because initial income is also included in the analysis, the effects to be discussed are effects on income growth during these ten years.

As a first step, Table 5 shows the zero-order correlations with later income of those variables which were important in explaining initial

income. The correlation between educational attainment and income of the later job is larger for whites than it had been with the first job; for blacks it remains substantially the same. With one exception (father's occupational status for blacks), the correlations of the background characteristics have decreased. The small size of the decreases, however, suggests that the impact of parental background may not have ended with its impact on the income of the first job, and should be considered in subsequent analyses. The pattern of differences between the two groups across all variables except education has remained the same.

Table 5 About Here

When the income of the tenth year is regressed on these background characteristics and on the income of the first year (Table 6), we find important differences between the characteristics that affect initial income and those that affect income growth. Parental background seems to have spent its influence on education and on initial income, and does not significantly contribute, for either blacks or whites, to income growth.[15]

Table 6 About Here

Marriage before the first full-time job is highly beneficial to income growth for both groups, considerably more for whites than for blacks, and greater for both groups than in its relation to initial income. Military service before the first job appears to be unimportant for income growth for whites, even showing a negative coefficient (but with a t-value of only 1.2). However, for blacks, this factor continues to be important to income growth.

The major effects on income growth come from initial income and from educational attainment. The regression coefficients for initial income are high -- and higher for whites than for blacks. If later income were perfectly predictable from initial income, the coefficients would be 1.0; numbers lower than 1.0 can be interpreted to be the extent to which later income is not predictable from initial income. The high coefficient for whites indicates the extent to which incomes of whites are predictable from earlier income; the fact that the coefficient for blacks is considerably lower indicates the lesser predictability of black income from earlier income.

This regression shows that educational attainment has not spent its effect on initial income, but continues to affect income growth for both groups. Most striking, however, is the fact that education is now considerably more important for whites than for blacks, in contrast to its greater effect for blacks in establishing initial levels of income. Thus, it is clear that the effect of education on income growth is higher for whites than for blacks. This is in contrast to the results reported for occupational status where the size of the effect of education on later status was similar for both groups.[16]

The comparison of first with later job can be made more explicit by partitioning the differences in income of first and later job among the three components, levels, effects, and unexplained. This is done in Table 7.

Table 7 About Here

The differential effects of various independent variables may be shown more fully by partitioning Δy (effects) into different components. This is especially valuable since some of the resources are more effective for blacks, reducing the overall value of Δy (effects), as shown in Table 8.

Table 8 About Here

Table 8 shows the much greater efficacy of first job income, education, and marriage prior to the first job in generating later job income for whites. However, the remaining variables have negative signs. In other words, the two parental variables, military service prior to the first job, and the income adjustment variables have a greater efficacy for blacks. When all the components are summed, the total effects are greater for whites.

Factors Intervening Between Income of the First Year and Income of the Tenth Year

In order to further understand differences in income growth between blacks and whites, a number of intervening factors and experiences were measured for the ten-year period following the first job. Paralleling the analysis of occupational status, these are divided into four spheres of activities: further education, marital and family activities, residential movement and occupational activity.

Table 9 About Here

Table 9 shows the means and zero-order correlations with later income of these events and experiences. For comparison, the zero-order correlations of these variables with occupational status of the later job are also presented. For both blacks and whites, activities in the marital and family sphere show the highest correlations with income of the later job; educational activities are also of some importance. When we compare the zero-order correlations of these variables with later income to their zero-order correlations with later occupational status, we find similar patterns, except in education. In the last section we noted that educational attainment before the end of full-time education has impact on income growth for both blacks and whites, but considerably more for whites. However, the zero-order correlations of intervening educational activities with later income for whites is quite low, while for blacks the zero-order correlations with intervening activities such as part-time education and on-the-job training are comparatively high. The extent to which these variables do affect income growth for blacks will be discussed later.

In Table 6, the regression of later income on the background characteristics (adjusting for region of the country and remuneration-in-kind) explains 34.7% of the variance in later income for whites and 40.2% for blacks. When the events and activities in the four spheres are also included in such an equation, 36.5% of the variance for whites and 44.6% for blacks is explained. Thus, it appears that the overall importance of these activities is not extremely great in explaining later income but is somewhat greater for blacks than for whites. In order to see, however, which of these spheres is most important we can examine the amount that each adds to the variance accounted for by the background factors. Table 10 shows the average additional variance accounted for by each of these sets of variables, for both blacks and whites.[17]

Table 10 About Here

For whites, the table indicates that events in the residential sphere appear to account for most of the additional variance, followed by occupational activities. For blacks, activities in the marital and family sphere are most important, followed by educational activities. The importance of both of these areas for blacks appeared in the

analysis of later occupational status (Coleman, Blum and Sørensen, 1970).

While the table indicates the importance of various spheres of intervening events and experiences, the importance of specific variables can be examined in a regression of later income on all of the variables listed in Table 9, including also the background characteristics used in the regressions reported in Table 6. The regression coefficients and t-values from such a regression are presented in Table 11. For whites,

Table 11 About Here

only two of the intervening events are significant at the .05 level (t-value greater than 1.6).[18] Military service during the decade and duration of part-time jobs are detrimental to income growth. For blacks, however, a number of these variables, aside from background factors, are important. Specifically, part-time education and on-the-job training are important for income growth. Thus, while the prior educational attainment which blacks have at the time of their first job is less beneficial to their income growth than the education of whites, inter-

vening educational experiences are more important for their income growth than for that of whites. These types of activities for blacks were also found to be important for growth in occupational status in the earlier paper. In the marital and family sphere, the length of time the respondent practices birth control is important. In all likelihood, this variable represents a sense of planning which has occupational consequences.

Living in the North at the time of the later job is especially important for blacks. This is not surprising, given the differential wage scales (for both groups) between the two regions. At the time of the first year of income, 31.1% of the blacks were in the North; ten years later, 48.3% were in the North. Since incomes in the North are generally higher, the fact that an additional 17.2% of the blacks are in the North means that this effect contributes to growth in average incomes. Finally, periods of unemployment are detrimental to the income growth of blacks.

Earlier in the analysis, we computed the amount of the observed difference in initial income due to different levels of various resources and the amount due to the different efficacy of various resources between whites and blacks (Tables 7 and 8). A similar calculation can be performed for the later income using each of the clusters of variables included here.

The equations utilized for this purpose are eq. (1), (2), and (3) presented earlier. As before, Δ y (levels) is the difference in later income due to different levels of each of the variables, Δy (effects) is the difference in later income due to the unequal efficacy of these variables, and Δ y (unexplained) is the difference due to unmeasured variables. Using means and standard deviations from Tables 1 and 9, and regression coefficients from Table 11, we get the results in Table 12.

Table 12 About Here

There is a total difference in income between whites and blacks at the later time of $1889. The higher levels of background variables and their greater efficacy for whites accounts for $1687 of the difference. Of this, $750 is due to differing levels of background factors and $937 to the greater efficacy of these resources for whites.

For the intervening events and activities, efficacy is generally greater for blacks, although levels of resources are generally greater for whites. The end result is that the overall income due to different levels is $1001 greater for whites, while the efficacy of resources for

blacks reduces this difference by $284. In addition, there is an unexplained difference of $1171 favoring whites.

The results from the set of calculations in Table 12 can be compared with those of the decomposition of initial income presented earlier in Table 7. A comparison of our results shows that most of the increasing gap between the two groups is due to the greater efficacy of background resources for whites over the decade of labor force experience. Examining the analysis in detail (Table 6 vs. Table 11) shows that the gain is due to two factors: initial income and initial educational attainment. Educational attainment exerts an important effect on income growth, apart from its effect on initial income, an effect over twice as great for whites as for blacks.

We can compare these results with the analysis of occupational status in the earlier paper. There we found that the initial difference in status was also in part due to differential levels of resources, but less so than for income in the present paper. For later occupational status, the efficacy of background resources had increased slightly, but as in the present case was offset by the greater efficacy of intervening activities for blacks.

The analysis to this point, in conjunction with that of the preceding paper, leaves some unanswered questions: Why is there a major difference between the structure of effects on initial status and on initial income? (Whites' resources were considerably more efficacious for initial status while blacks' resources, though at a lower level on the average, were more efficacious for obtaining initial income.) And why do background resources (particularly education) become overwhelmingly more efficacious for income growth of whites than of blacks? (For later income, $937 of the white-black income difference is due to greater efficacy of whites' background resources.)

The evidence begins to suggest, even more strongly than it did earlier, that whites and blacks are using different strategies in obtaining initial jobs. It is as if whites are using their education and other background resources to obtain jobs with higher status, paying little attention to initial income, while blacks are doing the opposite. This could account for the greater efficacy of whites' background resources for initial status and the greater efficacy of blacks' background resources for initial income.

This does not explain, however, the much greater efficacy of whites' background resources for later income. This greater efficacy suggests that whites are, in fact, interested in income, not merely status, but are using a long-range strategy which proves to be successful -- a strategy of paying principal attention to the status of their early job, with the expectation that the job status will in the long run bring high income, even though it fails to do so immediately. In contrast, the strategy of blacks, using background resources for initial income, appears to be less successful over the long run.

If this hypothesis is true, then we should find that the initial occupational status of whites should have a relatively strong effect on later income -- much stronger than the effect of initial income on later status. A partial test of this hypothesis can be made by estimating two regressions for whites. First, later income can be regressed on background characteristics, initial income, intervening events and experiences, and initial status. Second, later status can be regressed on background characteristics, initial status, intervening events and experiences and initial income. If the hypothesis is true the (standardized) regression coefficient for initial status in the first regression should be greater than that for initial income in the second.[19]

Table 13 shows that this test is satisfied.

Table 13 About Here

A similar test can be carried out for blacks, to determine whether the same strategy, when employed by blacks, can be expected to be as effective. The low regression coefficient for initial status in the regression where later income is the dependent variable indicates that this is not a viable strategy for blacks -- initial status of a job does not lead to high income ten years later when the other background resources and intervening events are considered. Thus the difference in apparent strategies does not seem to be due merely to a greater foresightedness of whites. There appears instead to be a difference in the structure of the labor force experience to which the two groups are exposed. Further examination of these differences, however, must be reserved for a later paper. (Coleman, Berry, and Blum, 1971).

Summary

This analysis, based on retrospective life histories collected from white and black men, 30-39 years old in 1968, was designed to answer two questions: (1) What factors are the most important determinants of occupational achievement as measured by the income of the first full-time civilian job after last leaving full-time education, and the income of the job held ten years later? (2) What are the major sources of the observed differences in initial income and growth in income between blacks and whites?

The analysis indicates that the pattern of the determinants of initial income is similar for both whites and blacks, the most important determinant being educational level. However, education has a weaker relationship to initial income for whites than for blacks. Ten years later, education shows a stronger relation to growth in income for whites than for blacks.

In assessing the differential impact of levels of education and other background resources on initial income, the observed difference of $473 is partitioned into three components. The first component is the portion of the total difference due to differences in the average levels of the

background resources. The second component is the portion of the difference due to the differential effects of these resources in establishing income. The third component is the remaining difference which remains unexplained, i.e. which is due to unmeasured variables. Results indicate that for the income of the first job, the black resources are more efficacious than those of whites, and it is only the greater average resource levels of whites that counteract this to create an initial income difference in favor of whites.

Four clusters of intervening events and experiences, occurring during the ten-year interval between the first job and the later job, were selected from four different spheres of activities. These were examined to see the extent to which they affect change in income. For whites, events in the residential and occupational sphere appear most important. For blacks, activities in the family sphere are most important, followed by educational activities.

When growth in income at the time of the later job is examined by use of the decomposition technique, the results are quite different from those of initial income. Apart from the increasing gap in income, now $1889, the efficacy of white background resources for income growth is greater than that for blacks, whereas the black resources were more

effective at the first time point. However, the efficacy of intervening events and experiences as measured is generally greater for blacks than for whites. It seems to be the intervening events and experiences, whose efficacy favors blacks, which keep the income gap from being even wider.

A comparison of the present work with a previous analysis of occupational status suggests that whites and blacks may be using different strategies in obtaining initial jobs. It seems as if whites are using their resources to obtain jobs with a high status, with the expectation that the job status will in the long run bring high income, while blacks are doing the opposite. Testing of the effectiveness of such a strategy (if it is a conscious strategy) indicates that it is effective for whites, while it would be much less so for blacks.

Footnotes

[1]The rationale for selecting these time points for both the first and later job has been discussed elsewhere (Coleman, Blum, and Sørensen, 1970, pp. 2-4). Experimentation with alternative measures of income of these two jobs, e.g. monthly income, led to substantially the same results as reported here. For a discussion of the income measures see Appendix A.

[2]These income figures are an adjusted yearly income in 1959 dollars.

[3]The universe of the two samples of this study is the total populations of black and nonblack males 30-39 years of age, in 1968, residing in households in the United States. Individuals in the sample were selected by standard multi-state area probability methods. The execution of the sample design consisted of two parts: (A) A national sample, designed to yield the required number of nonblack eligibles plus a number of eligible blacks proportional to their representation in the population as a whole; and (B) A supplementary selection of black

households only, designed to supply the additional eligible blacks required to satisfy the design. The black sample consists of blacks interviewed in the National sample and the blacks interviewed in the supplementary sample. Only individuals normally classified by the Census as Negroes are included in what we are calling the black sample. In each sample, selection was made so that each person in the universe had an equal probability of being interviewed. The analysis is based on 1589 cases: 738 blacks and 851 nonblacks. The overall completion rate for the study was 76.1% for Sample A and 78.2% for Sample B. For further details, see Blum et al, 1969.

[4]Education, both for the respondents and parents, was scored in the following way:

0: Less than four years of schooling

1: Elementary, four to seven years

2: Elementary, eight years

3: High school, one to three years

4: High school graduate

5: Post-high school, vocational, etc.

6: College, one to three years

7: Bachelor's degree or four years college

8: College, five years or more

Category 5 was used only if the respondent, or his parents, had previously completed high school. The measures of occupational status are the N.O.R.C. scores for all Census occupations (Siegel, 1971).

[5]Correlation between marriage prior to the first job and age at first job is .510 for whites and .423 for blacks.

[6]North includes the Census North and Census West; South is only Census South.

[7]It is recognized that the remuneration-in-kind considered here is only part of the differences between jobs; e.g., fringe benefits may also vary. The present study, however, does not contain information for further adjustments.

[8]For direct comparison with the earlier paper, a regression excluding region and remuneration-in-kind is reported in the appendix as Table A.1.

[9]A regression of initial income on all the variables listed in Table 1 explained 37.2% of the variance for blacks and 27.0% for whites, compared to 36.4% and 26.6% respectively, shown in Table 2. Regression coefficients shown in Table 2 were not substantially affected where these additional variables were included.

[10]See Table 5 of Coleman, Blum and Sørensen, 1970.

[11]In other words, $b_w\bar{x}_b$ compared to $b_b\bar{x}_b$ and $b_w\bar{x}_w$, where b is the regression coefficient, $\bar{x}$ is the mean value of a resource, and subscripts $_w$ and $_b$ refer to whites and blacks respectively.

[12]Here we compare $b_b\bar{x}_w$ to $b_w\bar{x}_w$ and $b_b\bar{x}_b$.

[13]This verbal exposition is the same as solving Eq. (1) above directly; the first term in this equation, i.e. for education, would be $\frac{1}{2}$ (250.3 + 295.2) (3.926 - 3.056) = $\frac{1}{2}$ (545.5) (0.870) = 237.29.

[14]When the location of the first job, i.e. North vs. South, and remuneration-in-kind are not taken into account, a similar decomposition

indicates that 78% of the difference is due to differences in background characteristics, -29% of the difference to the difference in the efficacy of these same resources, and 51% of the difference remains unexplained.

[15]It should be recalled that in a regression of this type, where a prior measurement of the dependent variable is included (here, income ten years earlier), the coefficients for the other independent variables are a measure of the effect of those variables on <u>increments</u> in the dependent variable.

[16]When lagged regressions are estimated identical to these but excluding region of the country in which the respondent lived in the tenth year and extent of remuneration-in-kind, the results reported above remain the same. Introducing these wage adjusting variables does not change the amount of variance explained for whites, but allows us to explain an additional 5% for blacks; i.e. R^2 = .339 for whites and .351 for blacks without these variables.

[17]In calculating this table, each sphere was treated as a unit and added, in different combinations with other spheres, to the basic

equations presented in Table 5. Fourteen such combinations exist and the table shows the average for each sphere.

[18]The estimated effect of a move is greater for whites than for blacks ($588 to $266). However, the variable is not significant for either group.

[19]Standardized regression coefficients are necessary because the differing dimensions make direct comparison of regression coefficients impossible.

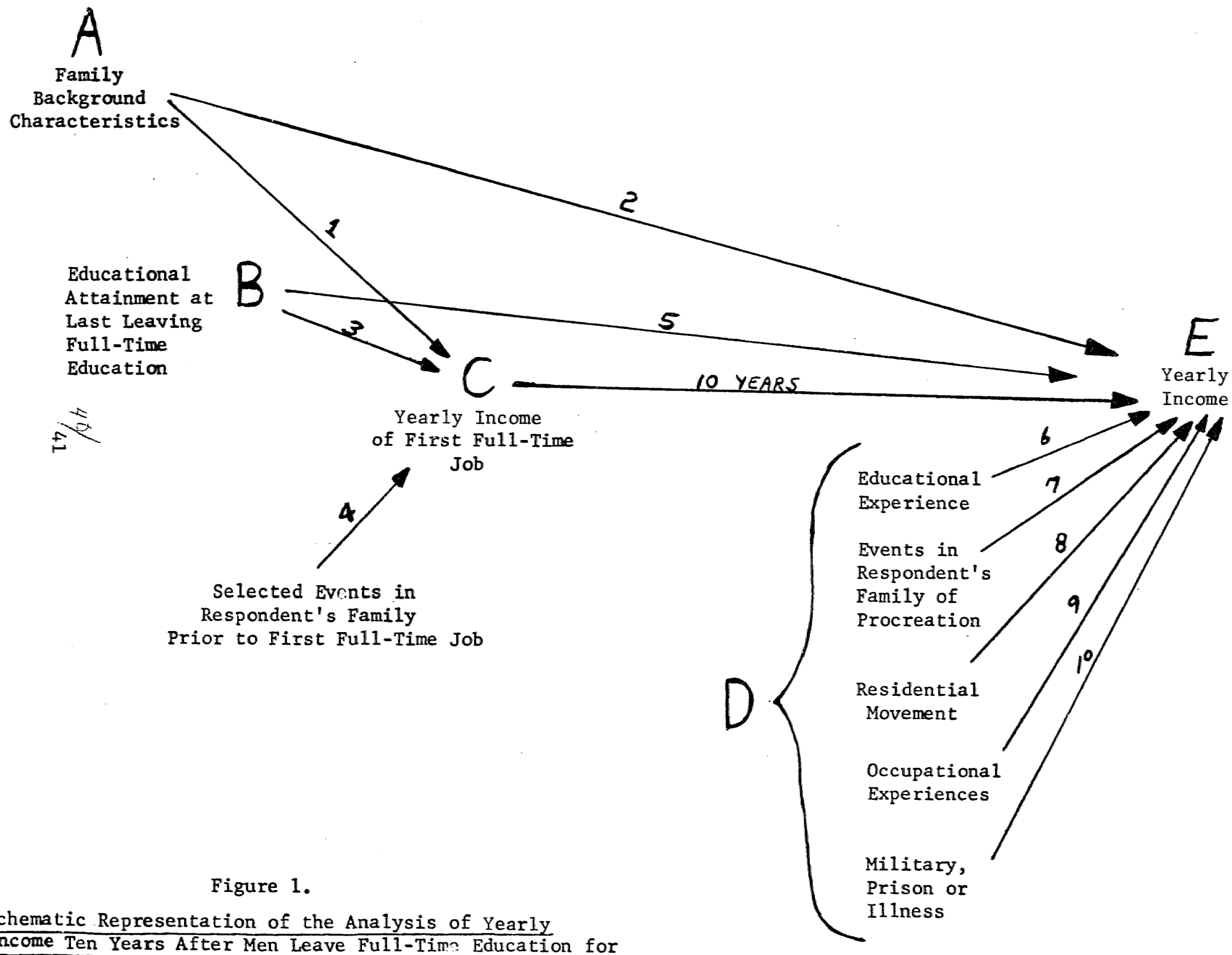

Figure 1.

Schematic Representation of the Analysis of Yearly Income Ten Years After Men Leave Full-Time Education for the Last Time

Table 1

Means and Standard Deviations of Characteristics of Family of Orientation Prior to First Job, and Zero-Order Correlations with Income of the First Year and Occupational Status of the First Job

Characteristics and Activities	Means		Standard Deviation		Zero-Order Correlations to Income of First Year		Zero-Order Correlations to Status of First Job	
	White	Black	White	Black	White	Black	White	Black
Father's Occupational Status	35.444	27.783	12.345	12.240	.182	.095	.242	.237
Father's Educational Attainment[a]	2.285	1.533	1.889	1.801	.212	.315	.227	.243
Educational Attainment at Time of First Job	3.926	3.056	1.696	1.533	.397	.466	.512	.398
First Job Obtained Through Family or Friends (Yes/No)	.509	.583	.500	.494	-.177	-.214	-.248	-.138
Military Service Prior to First Job (Yes/No)	.142	.122	.349	.327	.219	.339	.130	.253
Marriage Prior to First Job (Yes/No)	.145	.096	.352	.295	.238	.183	.263	.144
Birth Control Practice Prior to First Job (Yes/No)	.057	.017	.233	.129	.148	.114	.181	.136
Wife's Participation in Labor Force Prior to First Job, Months	.891	.394	4.551	3.360	.184	.132	.251	.158
Wife's Education at First Job[b]	4.582	4.444	1.684	1.778	.103	.292	.279	.526
Catholic (Yes/No)	.284	.076	.451	.265	-.016	.064	-.005	.013
Number of Illnesses Reported Prior to First Job	.639	.169	5.974	2.925	.008	.014	-.005	.158
Time Spent in Jail Prior to First Job, Months	.716	-0-	18.384	-0-	.081	-0-	-.011	-0-
Living in the North at First Job (Yes/No)	.733	.311	.443	.463	.194	.358	.079	.154
Remuneration-in-Kind During First Year, Months	.934	1.323	2.950	3.606	-.218	-.242	-.114	-.124

[a]For the scoring of education, see footnote 4.

[b]White based on 75 cases; black on 45 cases.

Table 2

Regression Coefficients and t-Values from Multiple Regression of Initial Income on Background Characteristics, Place of Residence and Extent of Remuneration-in-Kind During First Year

Independent Variables	White		Black	
	Regression Coefficient	t-value	Regression Coefficient	t-value
Educational Attainment	250.3	(6.5)	295.2	(8.3)
Father's Occupational Status	5.3	(1.1)	-9.8	(2.2)
Father's Educational Attainment	37.7	(1.2)	123.4	(3.9)
Military Service Before First Job	705.7	(4.5)	959.4	(6.2)
Marriage Before First Job	441.2	(2.7)	68.9	(0.4)
Living in North (Yes/No)	488.0	(4.0)	630.8	(5.6)
Remuneration-in-Kind, Months	-87.1	(4.8)	-54.3	(3.9)
R^2 =	0.248		0.362	

Table 3

Contributions to Expected Income for Whites and Blacks Produced by Differences in Levels of Resources and Differences in Efficacy of Resources

Independent Variables	White Equation ($b_w x_i$)		Black Equation ($b_b x_i$)			
	White ($b_w \bar{x}_w$)	Black ($b_w \bar{x}_b$)	White ($b_b \bar{x}_w$)	Black ($b_b \bar{x}_b$)	White $b_w(\frac{s_w+s_b}{2})$	Black $b_b(\frac{s_w+s_b}{2})$
	(1)	(2)	(3)	(4)	(5)	(6)
Educational Attainment	$983	$765	$1159	$902	$404	$477
Father's Occupational Status	188	147	-347	-272	65	-120
Father's Educational Attainment	86	58	282	189	70	228
Military Service Before First Job	100	86	136	117	239	324
Marriage Before First Job	64	42	10	7	143	22
Living in North (Yes/No)	358	152	463	196	221	286
Remuneration-in-Kind, Months	-82	-115	-51	-72	-286	-178
Constant	$1437	$1437	$1594	$1594		
Predicted Income =	3134	2572	3246	2661		

Table 4

Results from Decomposition of Differences in Income of First Full-Time Job Between White and Black Men

Difference due to:	Amount
Levels of Resources	$ 573
Efficacy of Resources	-183
Unexplained	83
TOTAL	$ 473

Table 5

Zero-Order Correlations of Background Characteristics with Income of the First Year and Income of the Tenth Year, for Black and White Men

Background Characteristics	White			Black		
	First Job	Later Job	Up or Down	First Job	Later Job	Up or Down
Educational Attainment	.397	.469	+	.466	.461	≅
Father's Occupational Status	.182	.165	-	.095	.127	+
Father's Educational Attainment	.212	.196	-	.315	.260	-
Military Service Before First Job	.219	.098	-	.339	.272	-
Marriage Before First Job	.238	.309	+	.183	.233	+

Table 6

Regression Coefficients and t-Values from Multiple Regression of Later Income on Background Characteristics and Initial Income

Independent Variables	White		Black	
	Regression Coefficient	t-value	Regression Coefficient	t-value
Initial Income	.82	(9.3)	.8	(7.9)
Educational Attainment	652.31	(7.2)	330.66	(5.9)
Father's Occupational Status	-2.04	(0.2)	-.20	(0.03)
Father's Educational Attainment	-43.05	(0.6)	26.74	(0.6)
Military Service Before First Job	-433.53	(1.2)	559.72	(2.3)
Marriage Before First Job	1509.77	(4.0)	676.23	(2.6)
Living in North at Later Job (Yes/No)	276.57	(1.0)	1065.46	(7.0)
Remuneration-in-Kind, Months in Later Job	-143.58	(2.6)	-39.19	(1.1)
R^2 =	.347		.402	

Table 7

Results from Decomposition of Differences in Income of First Full-Time Job and Income of Job Held Ten Year Later Between White and Black Men

Difference Due to:	First Job	Later Job
Levels of Resources	$ 573	$ 942
Efficacy of Resources	-183	225
Unexplained	83	722
TOTAL	$ 473	$ 1889

Table 8

Income Differences at Later Job Due to Differential Efficacy of Background Variables Between Black and White Men

Variable	Amount
Initial income	$ 513
Education	523
Military service before first job	-336
Father's Occupational status	- 23
Father's education	-129
Marriage before first job	270
Living in North at later job	-370
No. months with remuneration in kind	-223
Total difference in effects	$ 225

Table 9

Means and Standard Deviations of Events and Activities Intervening Between First Job and Job Ten Years Later and Zero-Order Correlations of These Variables with Later Income and Status of Later Job

Events and Activities	Means		Standard Deviations		Zero-Order Correlations to Yearly Income of Later Job		Zero-Order Correlations to Status of Later Job	
	White	Black	White	Black	White	Black	White	Black
Educational								
Duration of Part-Time Education, Months	9.607	4.426	19.959	12.608	.072	.158	.255	.263
Duration of On-the-Job Training, Months	13.160	7.257	26.882	21.721	.081	.202	.135	.151
Gain in Educational Attainment	.260	.139	.555	.441	-.017	.053	.125	.146
Marital and Family								
Length of Time Married, Months	66.470	56.983	40.092	41.150	.261	.255	.243	.178
Length of Time Practiced Birth Control, Months	28.748	12.193	39.715	28.408	.215	.286	.264	.269
Number of Children Born in Ten Years	1.790	1.617	1.371	1.640	.158	.088	.109	-.029
Length of Time Wife is in Labor Force, Months	15.355	16.351	29.314	27.224	.026	.241	.050	.240
Residential Movement								
Number of Locations Lived in Ten Years	3.349	2.382	2.062	1.467	-0-	.016	-.023	.036
In Military or Not in Ten Years (Yes/No)	.394	.275	.489	.447	-.176	.038	-.125	.045
Move Between North and South, or South and North	.082	.194	.274	.396	.053	.066	.045	-.018
Occupational								
Total Duration of Part-Time Jobs, Months	4.642	4.998	14.916	17.424	.004	.087	.064	.136
Duration in Military, Months	11.646	9.041	17.252	17.412	-.162	.035	-.089	.032
Total Duration of Unemployment, Months	1.255	2.194	4.003	6.460	-.026	-.073	-.108	-.006
Number of Jobs Held	5.070	4.139	3.006	2.265	-.001	-.027	-.035	.030
Wage Adjustments								
Living in North (Yes/No)	.744	.483	.437	.500	.110	.361	.049	.100
Months of R.I.K.	.464	.386	2.242	2.038	-.159	-.102	-.067	-.066

Table 10

Average Additional Contributions to Explained Variance in Combination with Other Variable Sets When Added to Variables in Table 6

Variable Sets	White	Black
Educational Activities	.0001	.0112
Marital and Family	.0017	.0221
Residential Movement	.0091	.0012
Occupational Activity	.0066	.0090
TOTAL	.0175	.0435

Table 11

Regression Coefficients and t-Values from Multiple Regression of Later Income on Events and Activities During Ten-Year Period in Educational, Marital, Residential and Occupational Spheres, and Including Background Characteristics

Independent Variable	White		Black	
	Regression Coefficient	t-value	Regression Coefficient	t-value
Intervening Factors				
Educational				
Duration of part-time education	0.74	(0.1)	7.46	(1.7)
Duration of on-the-job training	1.60	(0.3)	10.73	(3.2)
Gain in educational attainment	110.81	(0.4)	-114.70	(0.6)
Marital and Family				
Length of time married	0.46	(0.1)	1.40	(0.5)
Length of time practiced birth control	-1.75	(0.5)	10.55	(3.8)
Number of children born	80.55	(0.7)	44.66	(0.7)
Length of time wife in labor force	-3.88	(0.9)	2.15	(0.7)
Residential Movement				
Number of locations lived in during ten years	21.04	(0.3)	-4.46	(0.1)
In military or not	-916.07	(1.9)	-22.71	(0.1)
Move between North and South (either way)	588.89	(1.3)	265.88	(1.2)
Occupational Activity				
Total duration of part-time jobs	-13.17	(1.6)	-3.60	(0.9)
Length of time in military	3.72	(0.3)	-2.01	(0.3)
Total length of unemployment	19.37	(0.6)	-27.33	(2.4)
Number of jobs held	39.23	(0.8)	9.80	(0.3)
Background Factors				
Income of first job	0.83	(9.3)	0.50	(8.4)
Educational attainment	653.08	(6.9)	261.87	(4.3)
Father's occupational status	1.50	(0.1)	0.69	(0.1)
Father's educational attainment	-56.84	(0.8)	32.65	(0.7)
Military service before first job	-673.43	(1.8)	392.54	(1.6)
Marriage before first job	1312.70	(3.1)	311.28	(1.2)
Wage Adjustments				
Living in North at time of later job (Yes/No)	407.00	(1.4)	907.50	(5.2)
Remuneration-in-kind on later job, Months	-131.95	(2.3)	-39.72	(1.1)
R^2	0.364		0.446	

Table 12

Summary of Decomposition of Income Differences Between Whites and Blacks at the Time of the Later Job

Variable Set	Component		
	Levels	Effects	Unexplained
Background Characteristics	$ 750	$ 937	
Educational Activities	57	-217	
Marital and Family	93	-574	
Residential Movement	-96	-265	
Occupational Activity	32	267	
Income Adjustment	165	-432	
TOTAL	$ 1001	$ -284	$ 1171

Table 13

Summary of Regressions of Later Income and Later Status on Independent Variables Listed in Table 11 Modified to Test Differential Labor Force Strategies of White and Black Men

Dependent Variable	Additional Independent Variable	Regression Coefficient		Standardized Regression Coefficient	
		White	Black	White	Black
Later Income	Initial Status[a]	24.628	-5.344	.084	-.022
Later Status	Initial Income[b]	.000	-.023	.000	.007

[a]Added to variables listed in Table 11.

[b]Regression using variables listed in Table 11, but also including initial status since later status is the dependent variable and the interest here is in status growth.

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Appendix A

Note on Income

The income variables used throughout this analysis were ascertained as follows: in the life histories, respondents were asked to give starting and ending wages, appropriate time units for these wages (weekly, hourly, etc.) and the average number of hours worked/week for every job. Since our focus was on occupational status and not on employers, wages were recorded at status transitions whether they involved a change of employer or not. In distinguishing between full and part-time employment, we used the usual census definitions.

First, all income was converted to $/month. In those cases where hours were not reported, mean hours were estimated from Department of Labor statistics. In calculating monthly income, linear interpolation was used between starting and ending wages. The basic data, then, consists of a monthly income record for all periods of full and part-time employment for each respondent. The analysis is restricted to monetary wages.

In the present analysis, income for the first year of labor-force participation is calculated by summing monthly income for twelve months. We have, however, made the assumption that if income is known for 5 or more months of that year, it is reasonable to calculate the rate of full-time yearly earnings on the basis of the rate for the known months. Thus, if a respondent spent ten months in his first full-time job and subsequently entered the military, his income for the first year of labor-force experience was calculated at the rate of earnings for the first ten months.

Similarly, the income used in the present analysis for the tenth year is calculated by summing the monthly earnings five months prior to the month which marked ten years from the month he started his first full-time job to six months past that date; i.e., months 115-126 from the month in which he began his first full-time job. One hundred twenty-one respondents were unemployed (but in the labor force) for a fraction of their first year, and 58 were unemployed for a fraction of their tenth year. We assumed zero earnings for those months. Finally, at both time points a small fraction of the respondents did not know their income for part of the year in question. If information was unknown for more than seven months, observations were excluded from the analysis.

Table A.1

Regression Coefficients and t-Values from Multiple Regressions of Initial Income on Background Characteristics for White and Black Men

Independent Variables	White		Black	
	Regression Coefficient	t-value	Regression Coefficient	t-value
Educational Attainment	290.4	(7.5)	353.1	(9.8)
Father's Occupational Status	6.4	(1.3)	-10.3	(2.3)
Father's Educational Attainment	37.5	(1.1)	160.9	(5.0)
Military Service Before First Job	771.4	(4.8)	1070.8	(6.7)
Marriage Before First Job	340.1	(2.0)	71.6	(0.4)
R^2=	0.201		0.310	

Appendix B

Technical Note

When analyzing regression equations for two (or more) groups, it is possible to separate out the proportion of the difference in dependent variables (in our case income) between the two groups due to different values of the independent variables and the proportion due to the different efficacy of the independent variables. By "efficacy" of an independent variable we mean the effect of the independent variable in changing the dependent variables, as expressed by regression coefficients of the independent variables. Consider, with our data, the white average income of later job, $6699, and the black average of the later job, $4810. The difference between these two is $1889. If we think of this $1889 difference as the excess income of whites over blacks, then we can conceive of it broken into three additive parts: the excess income due to different <u>levels</u> of the independent variables (including both prior resources and intervening events); the excess due to different <u>efficacy</u> of these variables in increasing income; and the excess due to other unmeasured factors. That is, $y_w - y_b = \Delta y_{wb}$ (= 1889) [illegible] splitting

Δy_{wb} into three parts, gives $\Delta y_{wb} = \Delta y$ (levels)+ Δy_{wb} (effects) + Δy_{w} (unexplained). These three components may be found simply by operations on the two regression equations. First, subtracting the black equation from the white, and using $\bar{x}$ and $\bar{y}$ to represent mean values:

$$\bar{y}_w - \bar{y}_b = \sum_{i=0}^{n} b_{iw}\bar{x}_{iw} - \sum_{i=0}^{n} b_{ib}\bar{x}_{ib} \qquad \text{B.1}$$

where the initial value of y (first-job income) is relabelled x_i, and the constant term is included as variable 0, with $x_0 = 1$. In addition, when the regression is a lagged regression as here, let the indices on x_i be such that y at the earlier time (y_0 by previous notation) is labelled x_i. Addition of $\frac{1}{2}\Sigma b_{iw}(\bar{x}_{ib} - \bar{x}_{ib}) - \frac{1}{2}\Sigma b_{ib}(\bar{x}_{iw} - \bar{x}_{iw})$ to the equation, and factoring gives:

$$\bar{y}_w - \bar{y}_b = \Delta \bar{y}_{wb} = \tfrac{1}{2}\sum_{i=0}^{n}(b_{iw} + b_{ib})(\bar{x}_{iw} - \bar{x}_{ib}) + \tfrac{1}{2}\sum_{i=0}^{n}(b_{iw} - b_{ib})(\bar{x}_{iw} + \bar{x}_{ib}) \qquad \text{B.2}$$

Heuristically, each term of the component under the first summation sign on the right hand side is the difference in average levels $(\bar{x}_{iw} - \bar{x}_{ib})$ times the average of the two regression coefficients $(b_{iw} + b_{ib})/2$. This corresponds to our intuitive notion of the differences in the dependent variable due to difference in average levels, since it is the difference in average levels multiplied by the average regression coefficient.

(The first term is zero since $\bar{x}_{0w} = 1$ and $\bar{x}_{0b} = 1$.) Thus:

$$\Delta y \text{ (levels)} = \tfrac{1}{2} \sum_{i=1}^{n} (b_{iw} + b_{ib}) (\bar{x}_{iw} - \bar{x}_{ib}). \qquad \text{B.3}$$

The terms under the second summation sign must be further partitioned to separate out the contribution due to Δy from different effects of the independent variables, and the contribution made by unmeasured variables. This may be done in a way that makes Δy (effects) independent of the zero points of the independent variables by multiplying $b_{iw} - b_{ib}$ by some standard amount of variation in x_i, rather than by $\frac{1}{2} (\bar{x}_{iw} + \bar{x}_{ib})$, shown in eq. B.2. Such a standard amount of variation is the average of the standard deviations of x_{iw} and x_{ib}, that is, $\frac{1}{2} (s_{iw} + s_{ib})$. The remaining contribution to Δy can be described as the amount of Δy that is unexplained, due to unmeasured variables. Each term in the quantity under the second summation sign on the right can be partitioned into two components, giving

$$(b_{iw} - b_{ib}) (\bar{x}_{iw} + \bar{x}_{ib}) = (b_{iw} - b_{ib}) (s_{iw} + s_{ib}) + (b_{iw} - b_{ib}) (\bar{x}_{iw} - s_{iw} + \bar{x}_{ib} - s_{ib}).$$

Then we have

$$\Delta y \text{ (effects)} = \tfrac{1}{2} \sum_{i=1}^{n} (b_{iw} - b_{ib}) (s_{iw} + s_{ib}) \qquad \text{B.4}$$

$$\Delta y \text{ (unexplained)} = \tfrac{1}{2} \sum_{i=0}^{n} (b_{iw} - b_{ib}) (\bar{x}_{iw} - s_{iw} + \bar{x}_{ib} - s_{ib}). \qquad \text{B.5}$$