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EARNINGS GROWTH ON THE JOB AND BETWEEN JOBS

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This paper uses detailed data on the salary histories of individuals to show how an individual's observed earnings growth can be decomposed into growth occurring on the job and growth occurring between jobs. It is shown that the relative contributions of these two components to overall earnings growth differ across race and education groups. Further, as predicted by the specific training hypothesis, the more mobile individuals are found to have smaller on-the-job earnings gains in absolute *terms than the less mobile.*

Job mobility is an important characteristic of the working life histories of men. According to the U.S. Department of Labor,[1] a young man at age 20 can expect to have 6.6 job changes in the next forty years of his working life with 60 percent of these moves occurring before he reaches the age of 35. Until recently, the scarcity of detailed data on work histories has resulted in mobility being studied as an aggregate phenomenon.[2] With the emergence of longitudinal data sets, however, economists have begun to study mobility from the point of view of the individual. These studies have considered such topics as the relationship between an individual's characteristics and his turnover behavior and the estimation of a standard earnings function when information on an individual's job history is known.[3]

An important issue relating to an individual's work history has still not been addressed; namely, how important is job mobility for earnings growth? Although job changing is a common characteristic of workers, what proportion of earnings growth actually takes place between jobs and how does this proportion differ across groups of individuals? This paper provides direct evidence on this question by calculating, for different race-education groups, the actual amounts of earnings growth that occurred on the job and between jobs. Further, the relationship between these two magnitudes is shown to depend on the existence of specific training. Specificity of training produces a positive correlation between job duration and job investment which, in turn, results in

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1. See their Manpower Report No. 10 (1964).

2. For example, see Burton and Parker (1969) and Stoikov and Raimon (1968) for studies of inter-industry mobility.

3. See Bartel and Borjas (1977a) for a study analyzing the turnover behavior of middle-aged men and Borjas (1978) for a study that estimates the parameters of a segmented earnings function.

smaller on-the-job earnings growth for mobile individuals. The extent to which this smaller growth is offset by earnings growth between jobs is examined.

Part I of the paper discusses the manner in which earnings growth can be decomposed into its two components and shows the implications of specific training. Part II presents the calculations of the earnings growth components for the white and black men in the Coleman-Rossi Retrospective Life History Study. In Part III the relationships between the earnings growth components suggested by the theory of specific training are documented for this data set. The effects of education and experience are also analyzed. A summary is provided in Part IV.

I. DECOMPOSING EARNINGS GROWTH

Let an individual's current price-deflated earnings be given by $Y_{i,n}$ and his initial (e.g. first full-time job after completion of schooling) price-deflated earnings be given by $Y_{i,1}$. The observed differential between current and initial earnings can be decomposed into earnings growth on the job and earnings growth due to mobility. Let $Y_{i,1}$ be final earnings on the first job, $Y_{i,2}$ initial earnings on the second job, $Y_{i,2}$ final earnings on the second job, etc. Then earnings growth on the job is given by:

$$J = \sum_{j=1}^{n} (Y_{i,j} - Y_{i,j}) \tag{1}$$

where the individual has worked at n firms. Earnings growth due to mobility is given by:

$$M = \sum_{j=1}^{n-1} (Y_{i,j+1} - Y_{i,j}) \tag{2}$$

or, alternatively, it is found residually by calculating

$$M = Y_{i,n} - Y_{i,1} - J \tag{3}$$

To what can we attribute observed earnings growth? Some portion of J and M is certainly due to economy-wide increases in labor productivity; this can be netted out by using a productivity deflator. The remaining growth in earnings is largely due to the individual's acquisition of human capital over time. Many studies have shown that the life cycle pattern of earnings can be explained by the time profile of investments in human capital.[4] Thus the productivity-deflated J and M can be viewed as esti-

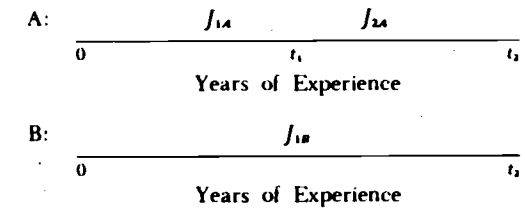
4. See Mincer (1974) for an analysis of 1960 U.S. Census data. See Rosen (1977) for a survey of the empirical evidence on the human capital model.

mates of the returns on job investment and mobility investment.[5]

The theory of specific training leads to an important prediction about the absolute magnitude of J, namely, that more mobile individuals will have smaller J than the less mobile. This prediction should not be confused with the obvious result that the mobile individuals will achieve a smaller *proportion* of their earnings growth on the job as compared to the less mobile. Rather, it can be shown that specificity of training will actually lead to smaller J in *absolute* terms for the more mobile; it then becomes an important empirical issue as to whether this smaller J is more than compensated by a larger M, i.e. whether mobility actually leads to larger earnings growth.

This prediction is obtained by noting that when some portion of on-the-job training is specific, the amount of investment in a job will be positively correlated with the completed duration of that job, i.e. earnings will grow faster in longer jobs. This occurs because specific training raises the worker's productivity only in the job in which it is received; its profitability, therefore, depends on the duration of that job. While longer expected job duration will lead to larger investments, the larger investments will, in turn, lead to lower turnover rates since the incentives for quits and layoffs will be reduced in order for the worker and the employer to collect the returns on their investments.[6] The result is, therefore, a positive correlation between job investment (i.e. the rate at which earnings grow on the job) and job duration.

Since more mobile individuals have, on average, shorter job durations than the less mobile, they will therefore have smaller on-the-job earnings growth if specific training exists. Consider the following example: individuals A and B have the same education and experience but A has held two different jobs during the course of his working life while B has held only one. This can be represented by the following diagram:



5. J is actually an upper bound estimate of the returns on job investment while M is a lower bound estimate of the returns on mobility investment. See the Appendix.

6. See Bartel and Borjas (1977b) for a reformulation of the marginal revenue from human capital investment when training is specific, and Becker (1975) for a discussion of the effect of specific training on turnover.

where J_{1A} = earnings growth on A's first job
J_{2A} = earnings growth on A's second job
J_{1B} = earnings growth on B's only job
t_1 = time period when A changes jobs
t_2 = current time period

Since B's job is of longer duration than either of A's jobs, the rate of growth of his earnings will exceed the rate of growth on either of A's jobs. This implies that $J_{1B} > J_{1A} + J_{2A}$; the more mobile individual will have smaller observed on-the-job earnings growth even though his total on-the-job experience is the same as that of the less mobile person.[7] Since individual A will probably have some earnings growth (actually, a once-and-for-all shift) occurring between his two jobs (i.e. at period t_1 while individual B will not have this component of earning growth, it is still possible that A's *total* earnings growth exceeds that of B. This remains an empirical question which will be explored in Part III. One problem with this example, however, is that it ignores the timing of job changes. For example, suppose there exists an individual C who makes one job change during his working life at a point that is very close to his date of entry into the labor market. Individual C should not be treated the same as individual A, since C has a job that is longer than either of A's jobs. Fortunately the data enable us to distinguish among these types of mobility patterns; this is discussed further in Part II.

II. ESTIMATES OF THE COMPONENTS OF EARNINGS GROWTH

The discussion in Part I showed that earnings growth could be decomposed into its two components if information on the starting and ending salaries for *each* of the individual's jobs was available. The Coleman-Rossi Retrospective Life History Study provides data of this nature for a national sample and a supplementary black sample of males aged 30-39 in 1968.[8] Tables 1 and 2 present the results of decomposing the earnings

7. While mobile individuals do spend some time between jobs, this represents a very small fraction of their overall work experience. In fact, for the data set that is used, whites who worked at more than one firm spent 1% of their time between jobs while blacks who worked at more than one firm spent 3% of their time between jobs. Thus it is reasonable to argue that the mobile and the non-mobile have the same amount of on-the-job experience. The finding below that the mobile individuals do, in fact, have smaller on-the-job earnings growth can not be said to be due to significantly less time spent on jobs in total.

8. It should be pointed out that the longitudinal data sets that are available (e.g. Michigan Income Dynamics, National Longitudinal Survey) can not be used for this analysis since they do not provide information on the starting and ending salaries for each of the individual's jobs. The data in the Coleman-Rossi Study were collected in January 1969 through personal interviews conducted by the National Opinion Research Center. Along with data on the individual's jobs, information was also gathered on geographic mobility, marital status, wife's labor force characteristics, etc. I restricted the sample to those individuals who always worked full-time since the completion of schooling and who reported beginning and ending salaries for each full-time job they held.

TABLE 1

Decomposition of Price-Deflated Earnings Growth for White Males in Coleman-Rossi Sample

	EDUCATION GROUPS				
	Less than 12 Years	12 Years	13-15 Years	16+ Years	All Individuals
(1) Total earnings gains	3655	3557	4590	5717	4358
(2) Job earnings gains	2789	3259	4057	5162	3796
(3) Mobility earnings gains	866	298	533	555	562
(4) Earnings gains per year of experience	204	242	323	670	354
(5) Job earnings gains per year of experience	155	224	293	542	299
(6) Mobility earnings gains per year of experience	49	18	30	128	55
(7) Productivity-deflated earnings gains	1708	1328	1696	2544	1805
(8) Productivity-deflated job earnings gains	934	1129	1276	2033	1331
(9) Productivity-deflated mobility earnings gains	774	199	420	511	474
(10) Number of firms	5.1	4.5	3.5	2.4	4.0
Sample Size	101	103	104	95	403

growth of the white and black males by using the method described in Part I. The analysis includes only those individuals who worked full-time since the completion of schooling.

The data in Tables 1 and 2 show that, in 1969, a 35-year-old average white male with approximately fifteen years of labor force experience had achieved gains in annual price-deflated earnings of $4,358 while his black counterpart had only experienced gains of $2,641.[9] This large racial differential was not due to the blacks having completed fewer years of schooling; within each education group, whites experienced larger earnings gains than blacks and this differential actually increased with education. Some portion of the observed earnings gains for the two groups was, of course, due to increases in the overall productivity of the economy. In other words, an individual's price-adjusted earnings grew,

9. The blacks actually had 15.5 years of experience on average, while the whites had 14.5 years. Note that experience is measured as time elapsed since the start of the first full-time job after completion of schooling.

TABLE 2

Decomposition of Price-Deflated Earnings Growth for Black Males in Coleman-Rossi Sample

	EDUCATION GROUPS				
	Less than 12 Years	12 Years	13-15 Years	16+ Years	All Individuals
(1) Total earnings gains	2629	2371	2734	3491	2641
(2) Job earnings gains	1740	1749	2821	2785	1997
(3) Mobility earnings gains	889	622	−87	706	644
(4) Earnings gains per year of experience	153	175	224	713	211
(5) Job earnings gains per year of experience	106	126	230	645	170
(6) Mobility earnings gains per year of experience	47	49	−6	68	41
(7) Productivity-deflated earnings gains	966	664	473	1268	827
(8) Productivity-deflated job earnings gains	158	212	698	648	297
(9) Productivity-deflated mobility earnings gains	808	452	−225	620	530
(10) Number of firms	5.5	4.7	3.7	3.0	4.6
Sample Size	202	102	67	28	399

in part, because improvements in technology made workers more productive. One would not want to attribute this earnings growth to investments made by the individual. When the earnings gains are deflated for these economy-wide increases in productivity, whites are now found to have achieved increases of $1,805 while blacks only had gains of $827.[10] Note that the productivity deflation sharpens the racial differential because the blacks experienced smaller earnings growth over this

10. The productivity deflators were obtained from Table 4.3 in Mincer (1974). Mincer calculated these deflators by comparing the growth rate of the income of a given cohort (stratified by education) from 1956 to 1966 with the growth rate over the ten-year period estimated in the 1966 cross section. The difference in these growth rates is an estimate of economy-wide secular growth. I used his estimates for individuals who were 25 years old in 1956. They are as follows: Under 8 years of schooling, 3.2 percent; 8 years of schooling, 2.2 percent; 9-11 years of schooling, 2.4 percent; 12 years of schooling, 2.7 percent; 13-15 years of schooling, 3.5 percent; and 16 years of schooling, 4.0 percent.

period.[11] To the extent that blacks have not shared equally in the gains from technological change, however, the productivity deflators are too high for this group; productivity deflation may, therefore, serve to overestimate the racial differential in earnings gains.

The decomposition of the earnings gains shows that, for the white males, 13 percent of the earnings gains that are unadjusted for economy-wide increases in productivity took place between jobs. When earnings gains are deflated for productivity changes, 26 percent of the growth in earnings occurs between jobs: productivity deflation has a stronger effect on job earnings gains than on mobility earnings gains because more time is spent on the job than between jobs.[12] In the case of the black males, 24 percent of their unadjusted earnings growth and 64 percent of their adjusted earnings growth takes place between jobs. The decomposition analysis therefore shows that most of the earnings gains of whites occurs on the job while the split is more even for blacks. This occurs despite the fact that the blacks in this sample are only slightly more mobile than the whites, having worked at 4.6 firms as compared to the whites' average of four firms. The data in Tables 1 and 2, therefore, show that the racial differential in earnings growth occurs because of differences in the rate at which earnings grow on the job for the two groups.

The results in Tables 1 and 2 also demonstrate that the relative contribution of mobility to earnings growth depends on the individual's education. For both race groups, individuals with less than twelve years of education receive a substantially larger proportion of their earnings growth between jobs as compared to individuals with more education. The true effect of education on absolute earnings growth can be measured only when experience is held constant. While Tables 1 and 2 show earnings gains per year of experience for each education group, a more accurate measure is obtained through the regression analysis which is discussed below.

11. Consider the following example of a white individual and a black individual who have the same education, the same productivity deflator, and jobs of equal length. (In fact, the blacks' jobs are approximately three months shorter than the jobs of the whites.) The white individual has a starting annual salary of $5,000 and an ending salary of $10,000 after five years of employment at this firm. The black individual starts at $4,000 per year and five years later when he leaves the firm he is earning $6,000. The undeflated differential for the white is $5,000 and the deflated differential, assuming productivity grows at the rate of 2 percent per year, is $4,058. The ratio of deflated to undeflated is .81. For the black, the undeflated differential is $2,000 while the deflated differential is $1,435. The ratio of deflated to undeflated is .72. If the black's earnings had also doubled, the ratio of the deflated differential to the undeflated differential would have been the same as that for whites. In other words, if blacks and whites experienced the same gains from economy-wide increases in productivity, more of the observed gains in black earnings could be explained by these general productivity changes since black earnings gains tend to be smaller than white earnings gains.

12. In this sample, the average time spent between firms is only two months while the average tenure at a firm is forty months.

III. REGRESSION ANALYSIS OF EARNINGS GROWTH COMPONENTS

The components of earnings growth that were calculated in Part II can be used to analyze several issues that other researchers have studied through the use of cross-sectional earnings functions.[13] For example, we can analyze directly whether more educated individuals, in fact, have larger earnings gains, and how earnings grow with experience. Further, as was discussed in Part I, a direct test for the existence of specific training can be performed on the earnings growth components. Finally, it can be determined whether mobility leads to larger overall earnings growth and how this differs for the two race groups.

Tables 3 and 4 present regressions on total earnings gains, earnings gains on the job and earnings gains between jobs for the two race groups. Equations were estimated for both earnings gains that were deflated for productivity and for gains that were not deflated for productivity; all earnings gains were price-deflated, however. The results show that for the white males the more educated individuals achieve larger total earnings gains even when adjustments are made for economy-wide increases in productivity. Thus, individuals who invest more in schooling are also found to spend more on post-school investments. This is a very reasonable finding since greater ability and better access to financing are important factors in both types of investment. While the correlation between schooling and post-school investments has been inferred from cross-sectional data,[14] the analysis of individual earnings growth shows the relationship directly. Further, the decomposition of earnings growth shows that the correlation between schooling and post-school investments does not hold for all types of post-school investment. The results in Table 3 show that education has a positive effect on job earnings gains but not on mobility earnings gains even though number of firms is held constant.[15] This indicates that the factors that induce individuals to invest in schooling and on-the-job training are not important determinants of mobility investment.[16]

In the case of the black males, education has a positive effect on earnings gains when the gains are not deflated for economy-wide increases in productivity. Since the productivity-deflated gains are a more accurate measure of the returns to job investment, the results show that

13. See Mincer (1974) and Borjas (1978).

14. Mincer (1974) estimated post-school investments for different schooling groups by observing cross-sectional experience profiles in the 1960 U.S. Census.

15. In spite of this, education has a positive effect on total earnings gains because, as Table 1 showed, most earnings gains occur on the job. This is also the reason why the positive correlation between schooling and total post-school investments was observed in cross-sectional data.

16. Alternatively, the findings could indicate that the gains from mobility can not be interpreted as returns on investment. These gains may reflect the individual's ability to capitalize on existing disequilibrium in the labor market.

TABLE 3

Regressions on Price-Deflated Earnings Growth
of Coleman-Rossi White Males*
(*t*-values are given in parentheses)

Independent Variable	Total Earnings Gains (not deflated for productivity)	Total Earnings Gains (productivity-deflated)	Job Earnings Gains (not deflated for productivity)	Job Earnings Gains (productivity-deflated)	Mobility Earnings Gains (not deflated for productivity)	Mobility Earnings Gains (productivity-deflated)
EDUC	479.85	171.62	492.21	189.88	−12.37	−18.26
	(6.90)	(3.15)	(6.77)	(3.28)	(−.23)	(−.34)
EXPER	546.74	159.04	493.22	110.76	53.52	48.28
	(3.92)	(1.14)	(3.38)	(.95)	(.49)	(.44)
$EXPER^2$	−11.78	−4.47	−8.65	−1.22	−3.13	−3.26
	(−2.38)	(−1.16)	(−1.68)	(−.30)	(−.80)	(−.84)
NFIRMS	38.65	67.86	−126.01	−85.64	164.66	153.50
	(.64)	(1.43)	(−1.99)	(−1.70)	(3.45)	(3.24)
R^2	.13	.03	.13	.04	.03	.03
Sample Size	403	403	403	403	403	403

*Key: *EDUC* = years of education
EXPER = years of experience since start of first full-time job after completion of schooling
$EXPER^2$ = EXPER x EXPER
NFIRMS = number of firms at which individual has worked since completion of schooling (full-time jobs only)

TABLE 4

Regressions on Price-Deflated Earnings Growth
of Coleman-Rossi Black Males*
(*t*-values are given in parentheses)

Independent Variable	Total Earnings Gains (not deflated for productivity)	Total Earnings Gains (productivity-deflated)	Job Earnings Gains (not deflated for productivity)	Job Earnings Gains (productivity-deflated)	Mobility Earnings Gains (not deflated for productivity)	Mobility Earnings Gains (productivity-deflated)
EDUC	88.96	−25.61	127.69	29.65	−38.73	−55.26
	(2.46)	(−.75)	(2.88)	(.73)	(−.83)	(−1.18)
EXPER	150.24	−3.27	166.89	34.50	−16.65	−37.77
	(1.64)	(−.03)	(1.48)	(.34)	(−.14)	(−.32)
$EXPER^2$	−3.18	−1.54	−5.23	−4.00	2.06	2.46
	(−1.02)	(−.52)	(−1.36)	(−1.14)	(.51)	(−.61)
NFIRMS	29.73	32.08	71.92	84.08	−42.19	−52.00
	(.89)	(1.02)	(1.74)	(2.24)	(−.98)	(−1.20)
R^2	.03	.01	.03	.04	.01	.01
Sample Size	399	399	399	399	399	399

*Key to variables is given in footnote to Table 3.

there is a very weak correlation between schooling and post-school investments for the blacks. The fact that education has a significant effect on the undeflated, but not the deflated, gains indicates that the larger earnings gains of the more educated blacks occur because of their greater share in economy-wide growth.[17]

The coefficients on the experience variables can be interpreted as estimates of the post-school investment profile. Since the productivity-deflated job earnings gains can be interpreted as the average return on annual job investment multiplied by the number of years of experience, the equation can be differentiated with respect to experience, resulting in:

$$\frac{\partial\,(\text{Job Earnings Gains})}{\partial\,\text{EXPER}} =$$

$$\text{(4)} \qquad \frac{\partial\,(\bar{r}_i\bar{C}_i \cdot \text{EXPER})}{\partial\,\text{EXPER}} = \bar{r}_i\bar{C}_i,$$

$$= 110.76 - 2.44\,\text{EXPER} \quad \text{(whites)}$$

$$= 34.50 - 8.00\,\text{EXPER} \quad \text{(blacks)}$$

Assuming a rate of return of ten percent,[18] the expressions in (4) imply that, looking across individuals, there is an average initial investment of \$1108 per year for whites and \$345 for blacks. Further, the white investment profile declines by \$24 per year while the black profile declines by \$80 annually. Thus blacks invest less than whites initially and their investment profile is considerably steeper.

The analysis in Part I showed that, if specific training exists, there will be a positive correlation between job investment and job duration. It was shown that this implied smaller absolute earnings gains on the job for the more mobile individuals. The results in Table 3 show that, among the white males, those individuals who have worked at more firms have significantly smaller job earnings gains, thereby confirming the specific training hypothesis. For the black males, the results are less clear. From Table 4 we observe a positive effect of *NFIRMS* on job earnings gains but this becomes negative when a quadratic term on *NFIRMS* is included

17. In footnote 10, it is shown that the estimates of the earnings growth rates due to economy-wide productivity growth are larger for the more educated. The technological change appears to be non-neutral with respect to education.

18. Ten percent is merely chosen as an example; the result that whites invest more than blacks would hold no matter what rate was assumed. One argument for choosing ten percent is that this is the rate of return that has been estimated for investments in schooling. See Becker (1975).

in the regression.[19] Similarly, for the whites, total mobility earnings gains increase with the number of firms while they have an inverted-U shape for the blacks.[20]

As was discussed in Part I, the use of *NFIRMS* as a measure of mobility ignores the timing of job changes which has implications for the individual's job investments. One way of accounting for this problem is to define three mobility patterns:
Pattern 1 — the individual has worked at only one firm (ONEFIRM);
Pattern 2 — the individual has worked at more than one firm but he has been at the current firm the longest *(CLONG)*; and
Pattern 3 — the individual has worked at more than one firm but he has not been at the current firm the longest. The timing problem would show up in a comparison of Patterns 2 and 3. The specific training hypothesis would predict that Pattern 2 individuals should have larger absolute earnings gains on the job than Pattern 3 individuals since their (Pattern 2) mobility took place early in their working lives. In other words they searched for a satisfactory job and, having found it, have remained in it until the present time. This would have increased their incentives for job investment. Of course, Pattern 1 individuals would also be predicted to have larger absolute earnings gains on the job than Pattern 3 individuals. Whether Pattern 1 or Pattern 2 individuals would have the larger job earnings gains is not clear if Pattern 2 mobility takes place very early in the working life.

Table 5 reports the coefficients on *CLONG* and *ONEFIRM* which are taken from earnings gains regressions in which *EDUC*, *EXPER* and $EXPER^2$ are also held constant. In other words, Pattern 3 individuals are the excluded group. As predicted by the specific training hypothesis, *ONEFIRM* and *CLONG* have positive signs in the job earnings gains regressions for whites and for blacks. The significance levels are somewhat higher when the earnings gains are not deflated for productivity. Accounting for the timing of job changes appears to clarify the ambiguous results for the blacks that were obtained when the NFIRMS specification was used.

Although the specific training hypothesis predicts that more mobile individuals will have smaller job earning gains, it says nothing about the effect of mobility on total earnings gains. Will the smaller job earnings gains of the more mobile be offset by their larger earnings gains between jobs? The results in Tables 3 and 4 show that mobility has a positive (almost significant) effect on the total productivity-deflated earnings gains of the whites, but an insignificant effect on the gains of the blacks. When a quadratic term on NFIRMS is added to the black equation, how-

19. The coefficient on *NFIRMS* becomes −117.55 with a *t*-value of −1.24 while the coefficient on $NFIRMS^2$ is 12.62 with a *t*-value of 2.31.

20. With the quadratic term in the black equation, the coefficient on *NFIRMS* is 229.33 with a *t*-value of 2.10 and the coefficient on $NFIRMS^2$ is −17.60 with a *t*-value of −2.81.

TABLE 5

Effects of Different Mobility Patterns
on the Price-Deflated Earnings Growth of Whites and Blacks[a]

	Not Deflated for Productivity			Productivity — Deflated		
	Total Earnings Gains	Job Earnings Gains	Mobility Earnings Gains	Total Earnings Gains	Job Earnings Gains	Mobility Earnings Gains
A. Whites						
ONEFIRM	−31.11	603.66	−634.78	−224.34	333.46	−557.81
	(−.06)	(1.18)	(−1.64)	(−.59)	(.83)	(−1.45)
CLONG	751.29	605.04	146.25	473.32	341.95	131.37
	(2.07)	(1.58)	(.50)	(1.66)	(1.13)	(.46)
B. Blacks						
ONEFIRM	307.35	1014.37	−707.02	34.55	638.23	−603.68
	(.82)	(2.21)	(−1.47)	(.10)	(1.52)	(−1.25)
CLONG	177.77	324.40	−146.63	27.62	162.49	−134.87
	(.85)	(1.26)	(−.54)	(.14)	(.69)	(−.50)

(*t*-values are given in parentheses)

[a] *EDUC*, *EXPER* and $EXPER^2$ are also included in these regressions.

ever, the t-value on NFIRMS rises to 1.40.[21] The mobility patterns specification in Table 5 also indicates an ambiguity in the returns to mobility for blacks. Among the whites, individuals who have worked at more than one firm but have been at the current firm the longest have significantly higher overall earnings gains. In other words, mobility that takes place early in the working life pays. Among the blacks, however, there is no significant difference in the earnings gains of the individuals in the three patterns. In other words, individuals who are still changing jobs (Pattern 3) are not worse off than individuals whose mobility took place early in their working lives.

IV. SUMMARY

This paper has shown how detailed data on an individual's salary history can be utilized to decompose his observed earnings growth into growth occurring on the job and growth occurring between jobs. This decomposition made possible the study of several questions that could not be handled with standard longitudinal data sets.

21. The coefficient on *NFIRMS* becomes 111.78 while that on $NFIRMS^2$ is −4.99 with a *t*-value of −1.08. Therefore, total earnings gains increase up until eleven firms. For the whites, $NFIRMS^2$ is also negative but the *t*-value is only −.50.

1. It was shown that the proportion of earnings growth that occurs between jobs varies across race and education groups. While only 26 percent of the price-and-productivity deflated earnings gains of the white males took place between jobs, 64 percent of the similarly deflated gains of the blacks occurred between jobs. Although the least educated individuals in both race groups had the largest proportion of earnings gains occurring between jobs, the differences between whites and blacks held within education groups. Further, it was shown that the racial differential in total earnings growth occurred because of differences in the rate at which earnings grew on the job for the two groups.

2. The positive correlation between schooling and post-school investments that has been inferred from cross-sectional data was shown here not to hold for all types of post-school investment. In particular, education had a positive effect on job earnings gains but not on mobility earnings gains even though number of firms was held constant.

3. Among the whites, the more mobile individuals were shown to have smaller on-the-job earnings gains (in *absolute* terms) than the less mobile which is a prediction of the specific training hypothesis. In spite of this, however, the mobile individuals had larger total earnings growth because their smaller on-the-job earnings gains were more than offset by larger earnings growth between jobs. Further, it was shown that the timing of mobility was important since individuals who had changed firms but had been at the current firm the longest had the largest total earnings growth. Among the blacks, the effect of mobility on job earnings gains and earnings gains between jobs conformed with the predictions of the specific training hypothesis when one accounted for the timing of job changes. The effect of mobility on the total earnings gains of blacks was ambiguous.

APPENDIX

J, earnings growth on the job, is an upper bound estimate of the returns on job investment while M, earnings growth between jobs, is a lower bound estimate of the returns on mobility investment. This can be shown as follows. An individual's observed earnings at any time t can be expressed as:

$$Y_t = E_o + \sum_{k=o}^{t-1} r_k C_k - C_t \tag{A-1}$$

where E_o is initial earnings capacity, the summation represents returns on dollar investment through period $t-1$, and C_t is current investment. Returns on investment in period t are not collected until the next period.

Using equation (A-1), the absolute change in earnings on the jth job can be written as:

$$\Delta Y_j = \sum_{k=i}^{t-1} r_k C_{j,k} - (C_{j,t} - C_{j,i}) \tag{A-2}$$

where $C_{j,i}$ is initial investment on this job, $C_{j,t}$ is final investment on this job and the summation is the returns on the investment undertaken in period i through period $t-1$ on this job. Since dollar investment costs are likely to decline over the job (see Ben-Porath, 1967), observed earnings gains will tend to overestimate returns on job investment.

Similarly, the change in earnings from the last period of the jth job to the first period of job $j+1$ can be expressed as:

$$Y_{j+1,i} - Y_{j,t} = r_m C_m + r_t C_{j,t} - (C_{j+1,i} - C_{j,t}) - \rho \sum_{k=i}^{t} r_k C_{j,k} \tag{A-3}$$

where $r_m C_m$ is the return on mobility investment, $r_t C_{j,t}$ is the return on the investment in the last period of the jth job, $(C_{j+1,i} - C_{j,t})$ is the change in investment costs and the last term is the loss in returns on specific training from the jth job. Since investment costs are likely to increase when a job change occurs (see Bartel and Borjas, 1977b) and some portion (ρ) of training is specific, the observed change in earnings is likely to underestimate the returns on mobility investment.

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