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A Nontechnical Analysis of the Distribution of Income

Designed to make the fruits of my research effort intelligible to the nonspecialist, this chapter presents an elementary analysis of the determinants of the distribution of labor market income. Within this framework it also discusses some of the more important aspects of the theory and findings comprising the technical chapters in Parts B and C.

EQUALIZING WAGE DIFFERENTIALS AND NONMONEY ASPECTS OF JOBS

No discussion of the theory of labor market income can ignore Adam Smith's contribution. In his 1776 volume, *The Wealth of Nations*, Smith introduced the idea of compensating wage differentials in competitive labor markets.[1] He wrote: "The whole of the advantages and disadvantages of the different employments of labor and stock must, in the same neighborhood, be either perfectly equal or constantly tending to equality. If in the same neighborhood there was any employment evidently either more or less advantageous than the rest, so many people would crowd into it in the one case, and so many would desert it in the other, that its

1. Modern Library edition, Book I, Chapter 10, p. 99. I am willing to wager that Smith's Chapter 10 is the most frequently cited work written prior to 1960 on reading lists in labor economics.

advantages would soon return to the level of other employments." That is, if in a single geographical area workers of equal ability can freely sell their labor services to any one of many employers, competition among workers for the jobs with more desirable nonmoney characteristics will make, on balance, all jobs equally attractive—the sum of the money and nonmoney benefits are equal.

Let us define a "job" as an employment at particular tasks, in a particular firm, in a particular location, under given working conditions. A change in a job can be thought of as a change in any of these characteristics. For example, acting as short-order cook for Nathans, located in Times Square in New York City, during the day shift, represents a job. An employment with a different task (manager), or firm (Chock Full O'Nuts), or location (Nathan's in Coney Island), or working condition (the night shift) would represent a different job.

Suppose there are two jobs, A and B, employing large numbers of workers, alike in all respects except for one characteristic. Job A is dirty, or physically strenuous, or dangerous, et cetera. Suppose for the moment that all workers are identical in all respects. Everyone views the different characteristic to be unfavorable to job A. For an equal wage in jobs A and B no one would select job A; everyone would want to enter job B. Suppose we wish to bribe people to enter job A by paying a sufficiently higher wage in job A (W_A) than in job B (W_B). Since we assume workers to be identical, they would all be willing to leave job B and enter job A for the same positive wage differential, which we call d_0 ($d = W_A - W_B$). For example, suppose job A represents employment as a short-order cook in the summer without air conditioning or a fan, and job B represents employment as a short-order cook in the summer with an electric fan. For the same wage, no one would want to work in job A, but, for a sufficiently larger wage in job A, job A would be preferable to job B.

Curve S_0 in Figure 2-1 shows the number of workers who supply their labor to job A at each wage differential.[2] If the difference in wages between jobs A and B were less than d_0, everyone would prefer to enter job B and no worker would choose job A. At a differential above d_0, all workers would want to enter job A and none job B. At the differential d_0, the workers are indifferent between jobs A and B.

Curve D_A in Figure 2-1 is a downward-sloping market demand curve for workers in job A relative to job B. The negative slope of

2. We assume a fixed population that will work in either job A or job B.

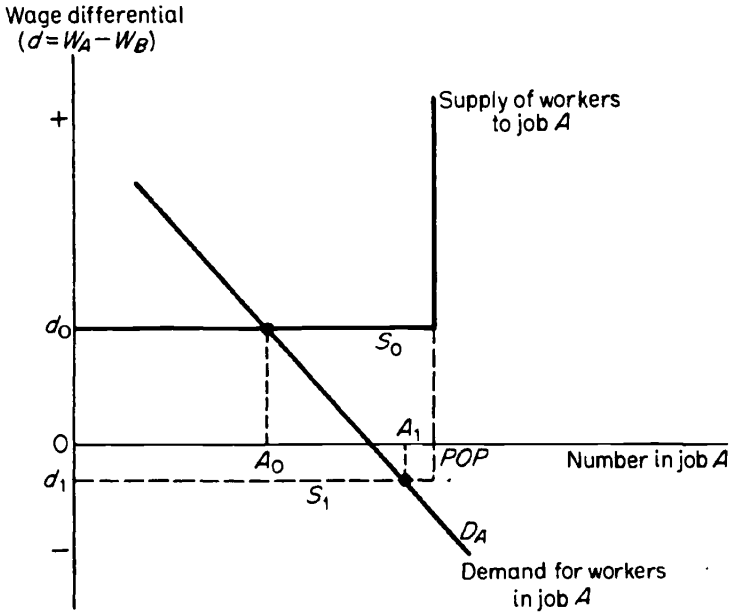

FIGURE 2-1
Supply and Demand for Labor—Homogeneous Tastes

the demand curve is based on the assumption that there is imperfect substitution of workers for one job compared to the other. The point where the demand curve and the supply curve intersect indicates the equilibrium number of workers in job A and the equilibrium wage differential between jobs A and B.

Shifts would occur in the supply curve if working conditions, or the perception of the working conditions, were to change. Job A initially has supply curve S_0 and a positive wage differential. Now, however, let us assume that demand conditions are unchanged, but that an air conditioner is added to job A, so that now job A is preferred to job B. The new supply curve is S_1, and a negative wage differential emerges; job A now pays less than job B.

Up to this point we have assumed that all workers have the same tastes for the characteristics of a job. People differ, however, in their evaluation of the same working conditions. Some have strong preferences for an air-conditioned office, while others prefer an office with a fan. In the context of our simple example, those who have a preference for the working conditions in job A compared to job B offer their services to job A even when the wage is lower than in job B. Those who are indifferent will enter job A if the wage in A is at least as large as in job B. Finally, those

who prefer the characteristics in job B to those in job A require the inducement of a higher wage in A than in B to enter job A. The supply of labor at a given wage equals the sum of all workers who would enter at that wage or at a lower wage. Thus, differences in tastes for the nonmoney characteristics of jobs result in a rising labor supply curve. (See curve S in Figure 2-2.)

Thus far we have considered the distribution of tastes for the two jobs and the resulting shape of the supply curve. The market wage differential (d) and the number employed in jobs A and B depend on both supply and demand conditions. The supply curve in Figure 2-2 depicts a situation where the majority of people dislike job A compared to job B. There are some, however, who prefer A to B. On the demand side, Figure 2-2 features three demand curves. With demand curve D_1, the quantities demanded and supplied are equal at a negative wage differential.[3] Suppose the relative demand curve for labor in job A shifts outward to D_2 and then to D_3. For the same supply relation, the outward shift of demand increases the wage differential ($d = W_A - W_B$), and more workers enter job A.

Note the difference between average tastes ($\bar{d}$) and marginal tastes (i.e., tastes at the intersection of the supply and demand curves). Market wages are determined by tastes at the equilibrium, and wage differentials depend on both supply and demand. Those who have a stronger-than-market taste for an activity (i.e., those who would enter at a wage differential below d_1) will be in that activity—in this case, job A. Those who have weaker-than-market tastes will be in the alternative activity.[4]

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3. Although most people dislike job A, there are enough who like it, given the demand D_1 for labor in job A, for the number of workers offering themselves at a zero differential to exceed the number demanded. For example, suppose 5 per cent of a 1,000-man workforce enjoys climbing poles so much that they are willing to be telephone pole climbers for lower wages than for otherwise "similar" work on *terra firma* (supply curve S). Suppose that for equal wages the phone companies wish to employ only thirty workers as pole climbers (demand curve D_1). Clearly, at equal wages in the two jobs, the supply of labor is greater than the demand for labor (fifty men compared to thirty jobs), so that pole climbers' wages will fall relative to wages in the other job. The fall in wages has two effects which help bring about market equilibrium. Because of the rising supply curve, fewer workers want to be pole climbers, and because of the downward-sloping demand curve more such workers are demanded.

4. The difference between the wage differential a worker requires to induce him to enter an activity (d_i) and the market wage differential (d_1) is called economic rent. Only the "man at the margin" does not receive economic rent.

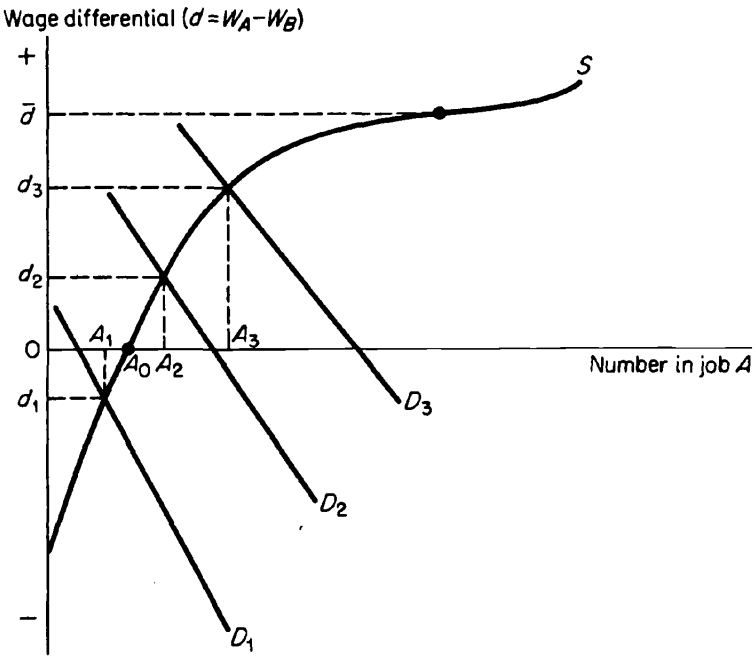

FIGURE 2-2
Supply and Demand for Labor—Heterogeneous Tastes

SEASONALITY AND ANNUAL INCOME

The analysis of compensating wage differentials is used in Part C's theoretical discussion of the effect of seasonality of employment on weekly wages and on annual earnings.

Let us assume that two jobs, A and B, have similar working conditions. At the start of each year (or each working life), a worker freely chooses between entering job A or job B, but he cannot reverse his decision within the year (or worklife). Job B involves a full year of employment, but job A is seasonal, providing work for only forty weeks per year. During the twelve weeks of unemployment in job A, the worker receives no wage from A. For simplicity let us assume he is unemployed during these twelve weeks. Although workers place a positive value on the weekly "income" received while unemployed (i.e., unemployment insurance and leisure), let us assume that they all evaluate this to be less than the weekly wage in job B.

Under equilibrium conditions, the real annual compensation in the two activities, job A and job B, would be equal. Since lower real weekly income is received in the "off season" in job A, workers enter job A only if the weekly wage while working in job A exceeds that of job B. Suppose the weekly wage in job B is \$100, providing a \$5,200 annual income. A worker receives \$45 per week as unemployment insurance for each week unemployed and values the leisure gained at \$30 per week. His annual income in job A at a weekly wage W_A would then be $40(W_A) + 12(45 + 30)$. The worker prefers job A if this sum exceeds \$5,200. At the weekly wage W_A = \$107.50, the worker earns the same annual income in the two activities; he enters job A only if the weekly wage in job A is equal to or greater than \$107.50. This simple model of wages in seasonal industries implies that jobs offering relatively less employment during the year offer higher weekly or hourly wages for the time actually worked. The higher wage compensates for less income during the period of unemployment.

If the wage rate were the same regardless of the number of weeks worked, annual income could be written as the product of annual income from a full year's employment and the fraction of the fifty-two weeks in the year the individual worked. A 1 per cent increase in the fraction of the year employed would then increase annual income by 1 per cent. The seasonality of employment model, however, postulates that those who work more weeks per year have a higher annual income but a smaller weekly income; a 1 per cent increase in the fraction of weeks worked would increase annual income, but by less than 1 per cent. The relationship between the per cent change in annual income and the per cent change in the fraction of weeks worked is called "the elasticity of income with respect to weeks worked" and is designated by γ. The seasonality of employment model implies that γ is positive but less than unity. (The parameter γ plays an important role in our analysis of income distribution in Part C.)

HUMAN CAPITAL

The basic framework employed in this study of income distribution is one in which the returns to an individual from labor market activity are a function of his stock of training—or "human capital." The concept of human capital will become clearer, and sound less cold-blooded, if each of the two component words are examined separately.

Capital may be defined as anything produced at a cost and providing useful services over time in either production or consumption. Thus, a drill press or a clothes washing machine are capital goods. Rainfall is not capital unless it is influenced by man.

There are some human characteristics which satisfy this definition of capital. For example, my knowledge of economics was created at a cost and has produced a stream of services over time. The cost of producing my stock of knowledge involved my foregoing both what I would have otherwise done with my time (opportunity cost of time) and what I would have otherwise purchased (goods and services). The services yielded over time by this capital include teaching and research, as well as my own consumption benefits from my knowledge of the subject.

There is, however, a fundamental difference between my "knowledge of economics" as capital and my "washing machine" as capital—my knowledge of economics is embodied in me. I can sell my "washing machine" and become unaffected by its use thereafter. I cannot sell my "knowledge," but can only rent its services to others. In addition, I must endure the conditions under which the renting of my labor services takes place: thus, I care whether I teach in an overheated classroom or one in which airplanes pass overhead every few minutes. Capital (productive power) embodied in a person is referred to as *human* capital.

Since human capital is created at a cost, no one would willingly invest in human capital unless it generated sufficient monetary or nonmonetary benefits to compensate for the cost. The analysis of investment in human capital is part of the broader analysis of compensating wage differentials.

Human capital can be acquired in several different ways. Schooling, vocational training, formal on-the-job training, learning by doing, medical care, acquiring information, and migration are means by which individuals can increase their productivity. Hence they create human capital. Unfortunately, we cannot directly measure units of human capital (i.e., productive power). This study focuses on the *money income*-producing effects of years of formal *schooling* and years of labor market *experience* after schooling, all of which are quantifiable.[5]

5. This does not imply that training is not productive outside of the market place. Several recent studies do, in fact, suggest that schooling is productive in household activities. For example, holding income constant, those with more schooling appear to be more efficient consumers, to have better health, and to provide a higher quality of child care. See, for example, Robert Michael, *The Effect of Education on Efficiency in Consumption*,

ONE PERIOD OF TRAINING

Training is not without costs. A year of schooling, for example, involves direct and opportunity costs. Direct costs are out-of-pocket expenditures that otherwise would not have been incurred, such as tuition charges and the cost of books. Opportunity costs, sometimes called indirect costs, are the monetary equivalent of the time devoted to the investment in schooling.

Suppose jobs A and B are alike in all respects except one: job A requires a year of training beyond high school, whereas job B requires only a high school education. If the two jobs offer the same annual income, all high school graduates will choose job B over job A and none will acquire the extra training required for job A. If the benefits from the two jobs are equal but job A requires expenditures before a worker can enter it, job A is inferior to job B. If, however, the annual income from job A exceeds the annual income from job B by an amount sufficiently large to compensate for the training cost, workers will be induced to acquire the extra training and enter job A. If there are individual differences in the ability to learn the task required for job A or individual differences in the evaluation of income received in the future, workers will differ as to the wage differential that will make them view the two jobs as equally attractive. That is, the supply of labor to job A relative to job B will be upward rising. With a demand curve for labor and a supply curve of labor, a market income differential (d) between jobs A and B emerges.

Under a few simplifying assumptions,[6] the rate of return from an investment (r) can be written approximately as the ratio of the

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New York, NBER, 1972; Michael Grossman, *The Demand for Health: A Theoretical and Empirical Investigation*, New York, NBER, 1972; Arleen Leibowitz, "Women's Allocation of Time to Market and Nonmarket Activities: Differences by Education," Ph.D. dissertation, Columbia University, 1972; and Zvi Griliches and William Mason, "Education, Income and Ability," *Journal of Political Economy*, Supplement, May-June 1972.

6. The assumptions are that the costs (c) occur in one period, the annual increment in wages (d) is constant over time, and that the differential is received for a very long period of time. The internal rate of return (r) is the rate of discount which sets the cost of an investment equal to the present value of the benefits from the investment. That is,

$$c = \sum_{t=1}^{N} \frac{d}{(1+r)^t}$$

where N is the number of periods in which benefits are received. However, if

annual differential (d) to the cost (c) of the investment, $r = d/c$. Therefore, the annual income of a worker in job A can be written as

$$Y_A = Y_B + d = Y_B + rc.$$

This is shown in Figure 2-3. The income line Y_A is higher than the income line Y_B by d dollars. The shaded area represents the cost of the training needed for job A.

Let us assume everyone in job A has the same income, and everyone in job B has the same income. Average income is higher, the larger the proportion of the population in job A, or the higher the average level of training in the population. There is no inequality in income if everyone is in job A or everyone is in job B. There is inequality if some workers are in job A and the others are in job B. In Figure 2-3 income inequality is largest when half of the workers are in job A and half in job B, that is, when the inequality of training is at a maximum.

We are also interested in the effect of the rate of return from training (r) and the amount of dollars invested in the year of training (c) on the average level and the inequality of income. Recall that the wage differential (d) was $d = rc$. For a particular distribution of investment in years of training (i.e., some workers in A and the others in B), the level and inequality of income is larger, the greater the differential (d). (See Figure 2-4.) Thus, the level and inequality of income is larger, the larger the rate of return from training or the larger the dollar investments.

$$S = \sum_{t=1}^{N} \frac{d}{(1+r)^t}$$

$$(1+r)\,S = \sum_{t=1}^{N} \frac{(d)(1+r)}{(1+r)^t}$$

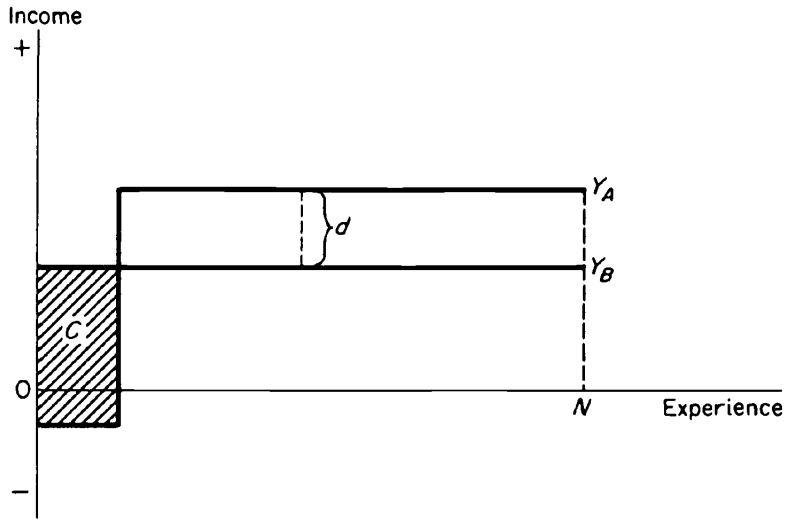
and

$$(1+r)\,S - S = \sum_{t=0}^{N-1} \frac{d}{(1+r)^t} - \sum_{t=1}^{N} \frac{d}{(1+r)^t}$$

$$r\,S = d - \frac{d}{(1+r)^N}$$

$$S = \frac{d}{r}\left(1 - \frac{1}{(1+r)^N}\right).$$

As N becomes large, S approaches d/r, and $c = d/r$. Hence, $r = d/c$.



C = opportunity costs (c_0) plus direct costs (c_d)

$Y_A = Y_B + r(c_0 + c_d) = Y_B + d$

FIGURE 2-3
One Period of Training

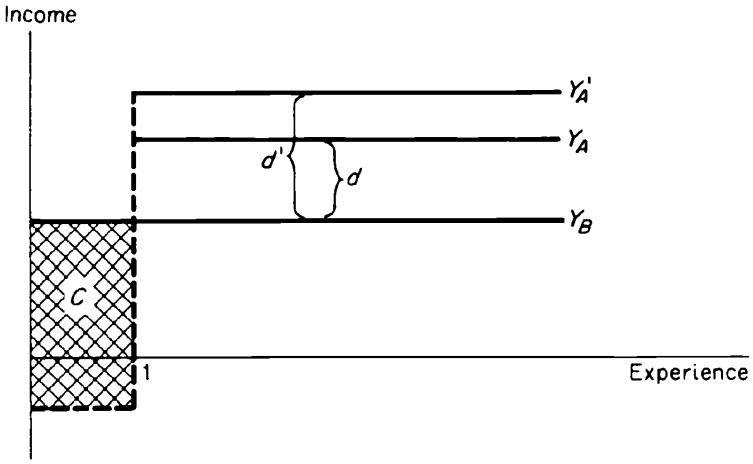


FIGURE 2-4
One Period of Training—An Increase in the Differential

SCHOOLING MODEL OF INCOME INEQUALITY

Part B develops and tests empirically a model that relates income to schooling. Data for the United States, Canada, and several other countries are employed and the effects of schooling computed for both differences in individual incomes within a region and differences in relative income inequality across regions.

Individual differences in years of schooling are found to be an important variable for explaining individual differences in income within regions. For the United States, differences in years of schooling explain from 17 to 51 per cent of individual differences in the income of adult males within each state, and 29 per cent is the average intrastate explanatory power of schooling. State differences in the rate of return from schooling and the inequality of schooling explain 60 per cent of state differences in the inequality of income. The greater income inequality in the Southern states can be explained by the greater inequality of schooling and the higher rate of return from schooling in the South.

The interregional analyses of income inequality for Canada and the Netherlands, as well as the various international analyses, provide additional support for the hypothesis that income inequality is larger, the higher the rate of return from schooling and the greater the inequality of schooling. Although less developed countries tend to have a larger inequality of income, this is not true when we adjust for intercountry differences in the inequality of years of schooling and the rate of return from schooling. That is, with the latter two variables held fixed, there is no relation, empirically, between income inequality and the level of income.

The model also provides a framework for understanding the income distribution effects of historical events and institutional arrangements which alter either the distribution of schooling or the rate of return from schooling. This is done through analyses of the income distribution effects of mass immigration into Israel, the effects of minimum schooling legislation on the distribution of schooling and hence also income in Great Britain and the United States, and the effects of economic change per se on income inequality.

MIGRATION AND THE RATE OF RETURN FROM SCHOOLING

If workers with high levels of schooling were perfect substitutes for those with low levels of schooling, relative wages would depend solely on technical production considerations (i.e., the substitution coefficient). For example, if one college graduate were always as productive as two high school graduates, the wage of the former would always be twice that of the latter, regardless of the relative supply of college graduates. There is evidence, however, to show that high-level manpower (college graduates) is qualitatively different from less-skilled manpower, and that the two factors are not perfect substitutes.[7] Hence, there is a downward-sloping demand curve for skilled manpower relative to less-skilled manpower. In terms of the analysis of income distribution, this negatively sloped relative demand curve plays an important role.

Let us view each state of the United States as a labor market. Wages of college graduates vary little across the states because of their high mobility. There is, in effect, a national labor market for college graduates. For those with less schooling, the tendency to migrate is weaker and there are significant state differences in wage rates.[8] The result: higher rates of return from schooling in the poorer states.[9]

Those with more schooling have a higher propensity to migrate for several reasons. First, schooling may increase a person's awareness of other areas and thereby reduce the cost of moving to a new environment. Second, college schooling itself often entails moving to a new area and thus loosens ties to the place of origin. Third, since those who acquire more schooling tend to be wealthier—and since greater wealth facilitates investment in all forms of human

7. See Carmel J. Ullman, "The Rise of Professional Occupations in the American Labor Force," Ph.D dissertation, Columbia University, 1972; and Finis Welch, "Education in Production," *Journal of Political Economy*, January-February 1970, pp. 35-59.

8. See Rashi Fein, "Educational Patterns in Southern Migration," *Southern Economic Journal, Supplement*, (Part 2), July 1965, pp. 106-124; June O'Neill, "The Effect of Income and Education on Inter-Regional Migration," Ph.D. dissertation, Columbia University, 1970; and Thomas J. Courchene, "Interprovincial Migration and Economic Adjustment," *Canadian Journal of Economics*, November 1970, pp. 550-577.

9. See Chapter 5 below; see also W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," *Journal of Political Economy*, April 1963, pp. 128-140; and Giora Hanoch, "An Economic Analysis of Earnings and Schooling," *Journal of Human Resources*, Summer 1967, pp. 310-329.

capital (including migration)—those with more schooling also tend to be those who invest more in migration. Fourth, because of direct costs of migration that are unrelated to skill level, the rate of return from migration tends to be higher for those with more skill.[10]

A higher rate of migration from the poorer states by skilled workers relative to unskilled workers increases the ratio of skilled to unskilled workers in the wealthier states and decreases it in the poorer states. Given the same negatively sloped demand curve for labor, the wage ratio of skilled to unskilled workers is depressed in the wealthier states and boosted in the poorer states. The result is a decline in the rate of return from schooling in the wealthier region and a rise in the poorer region.

The higher rate of return from schooling in the poorer regions within a country proves to be a major explanation for the larger inequality of income in the southern states of the United States (see Chapter 5). In addition, although the Atlantic provinces of Canada (the poorer provinces) have small inequalities of schooling, they have higher rates of return, and this tends to reduce interprovincial differences in income inequality.

An additional illustration is furnished by a time series study of income inequality in the Jewish population of Israel (see Chapter 6). Relative to the size of its population, Israel has experienced large exogenous immigration. During the two decades before independence (1948), the immigrants contained a high proportion of skilled workers. If we assume that the relative demand curve remained stable, the outward shift of labor supply should have depressed the relative wage of skilled workers—as, in fact, it did. In the decade after independence, the immigration primarily brought unskilled workers, and the relative wage of skilled to unskilled workers increased. These changes in the relative wage can be translated into movements in the rate of return from schooling. As predicted by the schooling model of income distribution, income inequality was small and showed a contracting tendency in the pre-independence period and an uptrend after independence.

POSTSCHOOL TRAINING AND INCOME DISTRIBUTION

In the section entitled "One Period of Training" (p. 18) above, a simple training model was used to demonstrate that the level and inequality of income are a function of the level and in-

10. For a proof of this, see Chapter 5 below.

equality of training, the rate of return from the training, and the dollar intensity of the relevant investment among individuals. Postschool training, however, is not an all-or-nothing investment made in the first year after the completion of formal schooling. In Part C, postschool training is viewed as a continuous variable in which the ratio of dollar investments to potential income is assumed to decline over time.[11] This permits dollar investments in training to be translated into years of experience (postschool training). The scarcity of data on dollar investments in training versus the availability of data on years of schooling and age virtually dictate that the empirical analysis be specified in terms of years of experience, where experience is measured by the number of years since leaving school.

The conclusions of the one-period-of-training model are generalized into years of experience (or age, if schooling is held constant), measured as a continuous variable. Within the levels of schooling, the average level of earnings of adults is expected to be higher the greater the average age (or the average level of experience) of the population. Similarly, the inequality of earnings is expected to be greater the more unequal the distribution of age (experience). The effect of a year of experience on income is referred to as the slope of the "experience-earnings profile." This slope steepens with larger dollar investments in postschool training and a higher rate of return from this training. Finally, the more the slope of the profile steepens, the stronger the effect of the age distribution on income distribution becomes. These are the basic hypotheses examined in Part C of this volume.

POSTSCHOOL TRAINING AND EMPLOYMENT

The relationship between the distribution of employment during the year and the distribution of annual income is explicitly examined in Part C below (p. 107). In this chapter we have already examined the concept of compensating wage differentials and the relationship between seasonality of employment and annual and weekly income. Here we turn to the theory behind another factor that influences individual differences in employment during the year: investment in postschool training.

11. The relative decline in investments occurs because life is finite (and, thus, there are a smaller number of periods in which to receive benefits from investments made later in life) and because the most profitable postschool training investments are made during the first few years in the labor market.

Investment in postschool training may be of two types: general and specific.[12] General training is training that is useful (productive) both in the firm in which it is acquired and in many other firms. Specific training, on the other hand, is productive only in the firm in which it is acquired. It includes learning the layout of the work-place, the procedures peculiar to the company, and the characteristics of fellow employees (supervisors and subordinates).

Since a worker with only general training is equally productive in many firms, he would stay in the firm in which he acquired the training only if it paid a wage at least equal to what he could obtain elsewhere. Thus, the firm would not be able to benefit from investing in the worker's general training, and therefore would not make such investments. Consequently, the worker finances the investments in his general training himself.

A worker with specific training is more productive in the firm in which he acquired the training than elsewhere. He would tend to stay with the firm in which he acquired his training if he is paid a wage greater than his best alternative. The firm is willing to finance some of the specific training if the worker, once trained, receives a wage less than his value to the firm.[13] Because of specific training, a worker's wage in a firm can be greater than his next best alternative and still less than his value to the firm.

Stability of employment increases with greater amounts of specific training because of the wedges between the cost to the firm of the worker (his wage), the worker's value to the firm, and his value to other firms. For example, assuming that wages do not decline during recessions, the value to the firm of workers with only general training decreases when a recession occurs, making it costly to the firm to retain the worker, since his wage exceeds his value. As a result, disemployment of workers begins. However, the case is different for workers with some specific training. Since their value to the firm is higher than their wage in a nonrecession year, when a recession does occur it may still be profitable for the firm to retain the workers, although their value to the firm may decline. Also, workers with more specific training have lower quit rates than those with less. This is so because the worker is more productive in the firm in which the specific training is acquired than elsewhere.

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12. The distinction between general and specific training and the analysis of the employment effects were developed by Gary S. Becker. See his *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, New York, NBER, 1974.

13. The value of a worker to the firm is the value of the extra output produced by him.

Workers who have more than average human capital of one type usually have more of other types, too. For example, those with higher levels of schooling also have higher rates of migration and make larger dollar investments in their postschool training.[14] It seems reasonable to conclude that those with more general training also have more specific training and consequently lower quit and layoff rates. Thus, because of specific training, ceteris paribus, the higher the weekly wages, the greater the fraction of weeks worked during a year.

Recall that we previously used the symbol γ to designate the elasticity of annual earnings with respect to the fraction of weeks worked during the year. If a 1 per cent increase in weeks worked does not change the weekly wage, annual earnings go up 1 per cent and $\gamma = 1$. In the case of specific training, however, those with 1 per cent more weeks worked have *higher* weekly wages and thus annual incomes which are larger by more than 1 per cent. Hence, γ exceeds unity. The seasonality of employment model discussed above suggests that, holding specific training constant, those who work 1 per cent more weeks per year have *lower* weekly wages and annual incomes that are larger, but by less than 1 per cent—hence γ is positive but less than unity.

In the empirical analysis of Part C, the elasticity γ is computed for white and nonwhite males and is compared to the value of unity. For white males the estimated value of γ does not differ from unity. For nonwhite males, however, the estimated γ is less than unity. This racial difference may be explained by smaller investments in postschool training and a greater seasonality of employment for nonwhite males.[15]

ANALYSIS OF LEVEL OF INCOME

If we pull together the analyses of the schooling, postschool training, and employment models discussed in this chapter, we can develop a framework for explaining regional differences in the

14. For migration, see references in footnote 8, p. 22. For postschool training, see Jacob Mincer, "On-the-Job Training: Costs, Returns and Some Implications," *Journal of Political Economy, Supplement*, October 1962, pp. 50-79, and *Schooling, Experience, and Earnings*, NBER, 1974, Part 2; also Thomas Johnson, "Returns from Investment in Human Capital," *American Economic Review*, September 1970, pp. 546-560.

15. For a study of racial differences in postschool training, see Mincer, "On-the-Job Training" and Johnson, "Returns from Investment in Human Capital." For racial differences in the seasonality of employment, see Chapter 7, p. 126, footnote 18.

level of earnings (or income) of adult males.[16] The level of earnings is positively related to the levels of schooling, age, and employment (weeks worked) during the year.[17]

Let us recall that the rate of return from training and dollar investments in training translate the distribution of years of training into a distribution of earnings. Thus, the greater the rate of return and dollar investments, the stronger the effect of the level of schooling and age on the level of earnings. Independent empirical evidence shows lower rates of return from training and smaller investments in postschool training for nonwhites than whites for the period under study.[18] Therefore, the schooling and age distributions can be expected to have a weaker effect on the earnings level of nonwhite males than on that of white males.

In the analyses for all males and all white males, the schooling and age variables explain approximately 70 per cent of interstate differences in the level of earnings. The variables have the expected effects and tend to be statistically significant.[19] The model is less successful in explaining interstate differences in the level of income.

In the case of nonwhite males, the schooling and employment (weeks worked) variables affect earnings in the expected direction and explain nearly 80 per cent of interstate differences in the levels of earnings and income.[20] The distribution of age appears to have no effect, and the distribution of schooling a weaker effect for nonwhites than for whites, on interstate differences in the level of earnings or income. White-nonwhite differences in the level of earnings across states are found to be due largely (80 to 90 per cent) to racial differences in the explanatory variables (particularly the lower levels for nonwhites in schooling and weeks of employment during the year).

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16. Chapter 7 is devoted to the development and testing of this model for the United States and Canada.

17. For technical reasons developed in Chapter 7, the level of income is also related to the inequalities of schooling and age.

18. Becker, *Human Capital*, Chapter IV; Finis Welch, "Black-White Differences in Returns to Schooling," *American Economic Review*, December 1973, pp. 893-907; Mincer, "On-the-Job Training"; Johnson, "Returns from Investment in Human Capital." An alternative explanation for the flatter nonwhite experience-earnings profile is a more rapid rise in school quality and job opportunities for young nonwhites compared to young whites.

19. The variable for the level of employment is not significant, but this may be because of its very small variation across the states for all males and all white males.

20. The employment variable, the mean log of weeks worked, has twice the variation across states for nonwhite males than it has for all males or white males.

In Canada, the schooling and age variables explain 95 per cent of provincial differences in the level of income of nonfarm males. Although the level of age does not have an independent effect, the level of schooling (and the inequality of schooling and age) have strong effects in the expected direction. The results are quite similar, therefore, to those obtained for the United States.

ANALYSIS OF INEQUALITY OF INCOME

Regional differences in the inequality of earnings or income can be analyzed by combining the implications of the schooling, postschool training, and employment models. These suggest that income inequality is greater the larger the inequalities of schooling, age, and weeks worked during the year. Each of these variables is included in the empirical analysis.[21] Higher rates of return from schooling and postschool training and larger dollar investments per year of training also increase income inequality. Rates of return from schooling are computed by race in each unit of observation (state or province). If, as appears to be the case, nonwhites have flatter experience-earnings profiles in the cross-section than whites, the effect of the inequality of age will be weaker for nonwhites than for whites.

The elasticity of earnings with respect to the fraction of weeks worked (γ) can be estimated from the analysis of income inequality. Since it appears that nonwhite male workers may invest in less postschool training and have greater seasonality in their employment than white males, the parameter γ is expected to be lower for the former than for the latter.

In the empirical analyses (Chapter 8) for all males and all white males in the United States, the model explains a large proportion of interstate differences in income inequality (85 to 92 per cent) and earnings inequality (approximately 80 per cent). The inequalities of schooling, age, and employment and the rate of return from schooling have strong positive effects on income inequality. In the parallel analysis for nonwhite males, the model performs equally well—approximately 85 per cent of the differences in inequality are attributable to the model. The inequalities of school-

21. The income inequality model for the United States and Canada is developed and tested in Chapter 8. Under the set of simplifying, yet technical, assumptions developed there, three additional variables enter the analysis—the covariance of schooling and age, the years of schooling, and the years of postschool experience.

ing and weeks of employment and the rate of return from schooling have significant positive effects on interstate differences in nonwhite income inequality. The elasticity of earnings with respect to the fraction of weeks worked (γ) is less than unity for nonwhite males, but not for white males.

Within states, the observed inequality of annual income is smaller for nonwhites than for whites. Since nonwhites experience a larger inequality in weeks worked during the year than whites, it follows that their inequality of weekly income is even smaller than the inequality based on annual income. This small intrastate nonwhite inequality of weekly income is not due to differences in the distribution of schooling or age, but to the rate of return from schooling and the effect on income of differences in age (experience). Thus, the smaller within-state inequality in income of nonwhites may be due, in part, to less investment in postschool training. A more important role can possibly be assigned to the greater rise in the quality of schooling and the quantity of job opportunities for young nonwhites than for young whites in the decade or two prior to 1960. This would tend to flatten the experience-earnings profile in the cross-section for nonwhites compared to whites.

Regional differences in income inequality are also studied with the Canadian provinces as the unit of observation. The schooling and age variables, including the rate of return from schooling, explain 75 per cent of provincial differences in the income inequality of adult nonfarm males.[22] The Canadian pattern is similar to that for nonwhite males in the United States: on the one hand, an insignificant effect of the inequality of age, and, on the other, significant positive effects of the rate of return and schooling inequality.

Thus, the human capital and employment model of income distribution outlined in this chapter (developed and tested in greater detail in Part C of this volume) appears to be a very powerful tool for studying regional differences in the level and inequality of labor market income.

22. Appropriate data are not available for analyzing the effects of differences in the distribution of weeks worked.