A RAND NOTE

FRINGE BENEFITS IN EMPLOYEE COMPENSATION

Arleen Leibowitz

April 1983

N-1827-HHS

Prepared for

The U.S. Department of Health and Human Services

35th Year

Rand

SANTA MONICA, CA. 90406

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PREFACE

The text of this Note was prepared for presentation at the National Bureau of Economic Research's Income and Wealth Conference on "The Measurement of Labor Cost," Williamsburg, Virginia, December 3-4, 1981. The author uses data supplied by individuals and their employers to determine how workers trade off money wages for fringe benefits. The data were originally collected as part of Rand's Health Insurance Experiment, supported by a grant from the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. Funding for the preparation of the Note was also provided by The Rand Corporation. The statistical advice of Naihua Duan and the comments of William Butz are gratefully acknowledged.

SUMMARY

Fringe benefits have become increasingly important to American workers, accounting for about one quarter of employee compensation. This report seeks to determine how fringe benefits modify rates of return to schooling and earnings comparisons between men and women. In addition, the relationship between the levels of wages and fringe benefits is estimated in order to determine if employees who receive low levels of benefits are compensated with higher wages.

A model of workers' demand for wages and fringe benefits demonstrates the importance of controlling for worker productivity when estimating the tradeoff between wages and benefits. Previous studies that have relied on establishment data to estimate the wage/benefit tradeoff have not adequately controlled for worker productivity differences. The current study has detailed data on worker productivity, supplemented by employer reports of those workers' benefits. The data used were collected as part of the Health Insurance Experiment (HIE).

Comparisons of HIE data with data from the 1972 Bureau of Labor Statistics (BLS) survey of firm compensation practices and the 1979 BLS Level of Benefits Survey confirm the reliability of the HIE benefits data. The HIE data also document that full-time workers are more likely to receive benefits than part-time workers.

Regressions on the sample of full-time workers show significant differences by sex in the receipt of fringe benefits. However, regression analysis indicates that lack of data on employee-specific taxable benefits does not greatly bias either rate of return to

schooling estimates or earnings comparisons between men and women. Accounting for marginal tax rates had a greater effect on rates of return to schooling than did fringe benefits. Further, the tax and benefit effects tend to offset each other.

Estimates of the wage-benefit tradeoff showed that employees earn compensating differentials when benefits are not provided on the job. However, among those receiving fringe benefits, wages were positively correlated with benefits.

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I. INTRODUCTION

Although economists generally measure employees' compensation by money wages, money wages account for a shrinking proportion of total employee compensation. In 1977 only 76.7 percent of employee compensation in the private, nonfarm economy was in the form of direct payment for time worked (BLS 1980b, p. 8). Paid leave (vacations and holidays) accounted for 6.1 percent of compensation, employer contributions to Social Security and other retirement programs for 8.5 percent, employer expenditures for life, accident, and health insurance, for 4 percent, and expenditures for sick leave, unemployment and bonuses accounted for the remainder. Between 1966 and 1977 nonwage compensation or fringe benefits grew at a faster rate than pay for time worked.

In spite of the importance of fringe benefits, labor supply models typically treat only the wage portion of compensation, while it is clear that total compensation is the relevant variable affecting labor supply. How much does this distort our conclusions? Clearly, if wages are only a part of labor compensation, and in fact are negatively related to benefits, wages alone may be a very error-prone measure of compensation. This would tend to bias toward zero the measured labor supply elasticities.

We show below that at higher tax rates, employees receive a greater proportion of their total income in the form of nontaxable benefits. Therefore, earnings functions that look at the wage portion of compensation will underestimate the total earnings of employees facing high marginal tax rates. Since more highly educated workers may face

higher marginal tax rates, they may take a greater percentage of their remuneration in the form of benefits. We would therefore underestimate the rate of return to schooling, because we measure a decreasing proportion of total compensation at higher wage levels. Earnings functions often show rates of return at high schooling levels which are low compared to market rates of return on capital (Freeman 1977). This could result from the unobserved returns in the form of benefits. If men and women receive different proportions of compensation in the form of benefits, we will also distort earnings comparisons among these groups.

Clearly, measuring the effect that ignoring fringe benefits has on estimates of labor supply and earnings functions requires data on factors affecting individuals' productivity and personal characteristics as well as on wages and fringe benefits. Some studies have considered how the amounts of fringe benefits supplied by employers vary with industry or employer but not employee characteristics (e.g., Goldstein and Pauly 1976). A recent survey of health care coverage (Taylor and Lawson, 1981) does contain the requisite demographic data but does not include information on the employer's payments for health insurance or on other fringes. Data sets with both employee characteristics and employer fringe benefit payments can be constructed by linking data from separate employer and employee surveys (e.g., Smeeding, 1983). By using means, however, we lose the data on individual characteristics which would allow us to hold productivity constant.

The present paper, instead of using establishment data, uses data on individuals which are supplemented by employer reports of those individuals' benefits. Data collected as part of the Health Insurance

Experiment (HIE) (Newhouse, 1974) are used to examine how the benefits received vary with employee characteristics. The HIE has cost data only for health insurance and vacation pay; it has data on individuals' receipt of other benefits, but not their value. These values, conditional on receipt of benefits, are estimated from the 1972 BLS Survey of firm compensation practices.

The paper is organized as follows: Section II presents a simple model of the division of compensation between wages and benefits. Section III describes the HIE data and other sources of data used in this study. Section IV compares HIE fringe benefit data with data from a large national sample, and presents earnings functions estimates. Section V has conclusions and data recommendations.

II. TRADEOFFS BETWEEN WAGES AND BENEFITS

WAGE-BENEFIT TRADEOFFS IN THEORY

Consider a model of the labor market where remuneration for a given worker consists not only of money wages, but also of benefits paid directly by the employer. Assume that employers combine capital and labor to produce an output, Y, according to the production function, $Y(p) = f(L, K)$. Each worker, L, is paid total compensation, $W^* = W + F$, where W is money wages, and F is the employer's cost of employment benefits. In a perfectly competitive equilibrium, $W^* = pf_1 \geq W + F$. Employers will be indifferent as to the composition of total compensation between money wages and benefits as long as it is below W^*. This is represented by the line W^*F^* in Fig. 1.

Employees have an indifference curve II^*, which defines their marginal rate of substitution between W and F. The tangency defines the optimal position for the employee. Many benefits are characterized by their nonmarketability. They can only be consumed as a tie-in to employment, and they are not transferable--for example, an employee cannot resell his health insurance or accept bids for his sick leave. Individual employees rarely can negotiate benefit packages with employers. However, employees are free to choose employers whose benefit mix maximizes their utility (see Goldstein and Pauly 1976). Employers, too, will have an incentive to adjust their mix to the expected tastes of their potential employees.

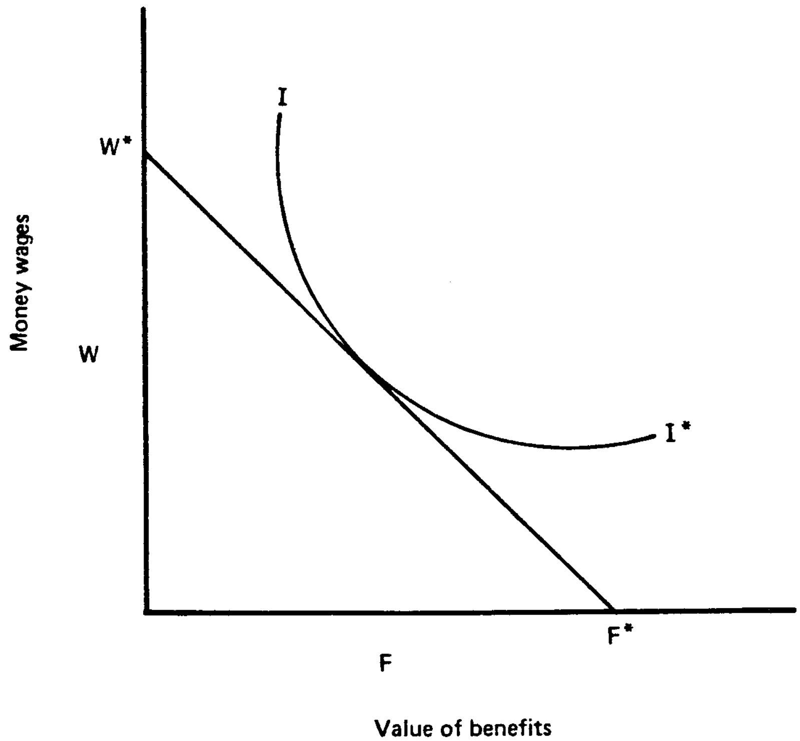

Fig. 1 — Tradeoff between wages and benefits

Thus, public school systems offer generous sick leave for their largely female workforce, while universities offer free tuition to their education-minded employees.

All these on-the-job benefits are available in the private market as well. Their provision as part of a total compensation package seems at first to deny the overly simplistic rule that welfare is increased more by cash transfers than by in-kind transfers (because the mix may not be optimal for some employees). However, a simple analysis of the employee's utility maximization indicates why in-kind benefits are provided on the job. We postulate that the employee's utility is a function of both market goods and employment-tied benefits.

$$U(X, B) \quad \text{where} \quad X = \text{purchased market goods}$$
$$B = \text{on-the-job benefits}$$

We distinguish three types of benefits from the employee's point of view. First, there are nontaxable substitutes for private consumption expenditures (such as employer-financed health insurance or subsidized lunches in the company cafeteria). Second, there are taxable substitutes for private consumption which the employer can provide at low cost because of quantity discounts (such as life insurance). Third, there are "paid vacations" and sick leave, which also are taxable. We assume that the employer is indifferent as to the composition of benefits among the three types, but the employee's marginal rate of substitution depends on the tax deductibility of the benefit.

For taxable benefits (including vacation) the employer pays

$$Y^{*} = Y + BP_B ,$$

where Y = money wages, and BP_b is the employer's expenditure on benefits, B at price P_B. Assume the employee spends his entire after-tax income on market goods, X, which have a price of P_x.

$$XP_x = (1 - t) Y - t BP_B ,$$

where t is the tax rate. That is, the employee is constrained to consume the entire benefit provided by the employer, and the tax on that benefit reduces his consumption of other goods. So the employee has the budget constraint

$$Y^{*} = (Y + BP_B) = (XP_x + BP_B)/(1 - t)$$

Using P_x as a numeraire and setting it to unity, we can solve for the ratio of marginal utilities:

$$U_x/U_B = 1/P_B$$

For nontaxable benefits the employer's budget constraint is the same, but the employee only gets the after-tax portion of wages, and he does not have to reduce his goods consumption to finance the tax on benefits.

$$XP_x = (1 - t)Y$$

The employee's budget constraint becomes

$$Y^* = Y + BP_B = (XP_x)/(1 - t) + P_B B$$

Thus the ratio of marginal utilities is modified to

$$U_x/U_b = 1/(1 - t)P_B$$

That is, the greater the tax rate, the lower the effective price of benefits. If employment is fixed, higher tax rates cause a shift to benefits.

Even from this cursory taxonomy of on-the-job benefits, it is evident why some classes of benefits exist: Given positive marginal tax rates, employers can purchase nontaxable benefits which are worth more to their employees than an equivalent expenditure on wages. Further, because of group rates, employers may effect economies of scale in providing even taxable benefits. Sick leave is a kind of disability insurance where the employer self-insures. Typically, for extended sick leave, the employer reinsures with a commercial agency or relies on government coverage. Vacation as a fringe benefit is harder to understand since providing "paid vacation" is equivalent to providing a wage increase. Perhaps "paid vacation" is more of a benefit for the employer than the employee since it is a mechanism whereby employers limit the amount of unpaid leave employees can take.

WAGE-BENEFIT TRADEOFFS IN PRACTICE

Ceteris paribus, there should be a negative relationship between wages and benefits. The problem for estimation is to hold productivity constant *in practice*. Establishment data, such as have been used in previous studies, have only the crudest indicators of productivity--production or white collar worker, union status, type of industry. With such data one is likely to pick up changes in benefits across levels of worker productivity, rather than tradeoffs between wages and benefits for a given employee. For this reason, it is not possible to obtain a meaningful hedonic benefits function from this type of data.

With disaggregated data on individuals, it is possible to control sufficiently for productivity that a wage-benefit tradeoff could be observed. Then wages and benefits should be negatively related. However, if there are unobserved factors affecting productivity, it is no longer true that observed wages and benefits will be negatively correlated, since benefits may be related to the unobserved productivity factors, which shift the entire wage benefit locus.

If benefits accounted for the same share of remuneration at all productivity levels, rate of return calculations would not be affected by not fully controlling for productivity. Since we expect higher proportions of benefits at higher tax brackets, the expansion path may veer toward benefits as wages increase. However, at some point, the demand for benefits may become saturated, as the marginal utility of benefits falls to zero. Government regulations may also limit the amount of benefits an employee can receive with favored tax treatment.

In this Note we can provide some evidence about the bias due to omitting fringe benefits in computing the increase in earnings due to additional schooling and in comparing earnings of men and women. There are insufficient numbers of blacks in the sample to make meaningful racial comparisons.

III. SOURCES OF DATA

HEALTH INSURANCE EXPERIMENT

Data for the multivariate analyses were collected by the Health Insurance Experiment, which is being carried out under a grant from the Department of Health and Human Services (previously Health, Education, and Welfare) to The Rand Corporation. The purpose of the HIE is to address questions of health-care financing by experimentally enrolling families in a variety of health insurance plans which vary in the amount they reimburse families for medical expenditures. (The study design is described in Newhouse 1974.) As part of this effort, data on wages, income, and fringe benefits were also collected. Beginning in 1974 a total sample of 7706 individuals in 2756 families has been enrolled at six sites: Dayton, Ohio; Seattle, Washington; Fitchburg, Massachusetts; Franklin County, Massachusetts; Charleston, South Carolina; and Georgetown County, South Carolina. Participants were enrolled for a period of either three years or five years. Early results on the response of medical expenditures to variation in reimbursement are reportd in Newhouse et al., 1981.

Eligibility for paticipants is quite broad. The only ineligible people are those 62 years of age and older at the time of enrollment, and persons with special health-care options such as members of the military, persons in prisons, recipients of disability Medicare, and veterans with service-connected disabilities. In addition, low-income families were slightly over-sampled, and those with incomes in excess of $25,000 (in 1973 dollars) were not eligible. This represents the upper

7 percent of the income distribution. Families in the experiment are representative of families in their site, although because of the income restriction, they do not represent a random sample. The sample as a whole is not a random sample of the U.S. population, but the sites do cover a mix of urban and rural, Northern, Southern, and Western sites. This allows estimation of regional and city-size effects.

Over the life of the study, data are collected on demographic and economic variables, health status, utilization of health services, type of health services received, and type of providers utilized. Demographic and economic data were elicited in a baseline interview prior to actual enrollment.

Income data are updated annually, when respondents are asked to copy from their income tax forms information on earnings, interest, dividends, federal, state, and local taxes paid, tax credits, and nontaxable income. From these data marginal tax rates are calculated. Wage and labor supply data are updated at four- to six-month intervals. Each person over age 16 fills in a mailed questionnaire with employment data. A flexible format allows respondents to report hourly, daily, weekly, biweekly, monthly, or annual earnings. For this study all earnings were reduced to an hourly basis using data supplied in the same questionnaire on weekly hours of work and weeks worked per year. Wage data were obtained for a primary and secondary job, but only the wage data for the first job are used in this Note. To the extent that employees generally receive benefits only on fulltime jobs, this gives a more accurate impression of the coverage of employees. The Periodic Employment Report also asked whether the respondent was eligible at his first job for "employer-paid accident insurance" and "employer-paid life

insurance." "Employer-paid" was defined as insurance for which the employer paid any part. The amount of the premium paid on behalf of the employee is not known.

Vacation and sick leave data were obtained directly from employers by means of the Sick Leave Abstraction form. Employers were identified from the preceding Periodic Employment Report. Employers reported the number of hours, days, or weeks of vacation for which each of their employees in the HIE was eligible. Employers supplied a great deal of detail about sick leave: whether it accrued with length of service, or was a fixed amount per illness or per period of time, or was given at the employer's discretion. Whether the employee received full or partial pay for sick-loss days, whether benefits began on the first day of illness, and whether sick leave could be accumulated were also determined. Sick leave data were not obtained for persons who were self-employed, so they have been eliminated from this analysis.

Vacation and sick leave data were obtained from employers in 1978. Wage data corresponding to the same time period were obtained from Periodic Employment Reports administered in March 1978 for Dayton and September 1978 for the Seattle, Massachusetts, and South Carolina sites.

Health insurance benefits could not be obtained for the identical time period because after enrollment all HIE subjects received their HIE-assigned insurance package. Therefore, the health insurance measure relates to the benefits workers received before enrollment in the HIE. Because many workers had changed jobs in the several years between enrollment in the study and the time at which we obtained wage data, the available sample size was smaller for analyses using health insurance data. The sample was further reduced because data were only available

for a subsample of employees. For those with data, the measure is the annual employer contribution to health insurance premiums, as reported by the employer. The HIE data base also contains detailed information on the provisions of health insurance held by employees in our study prior to their enrollment in the experimental HIE plans. Marquis (1981) describes how these data were obtained by abstracting descriptive booklets provided by employers. She finds that most families were well informed about some aspects of their health insurance coverage, but many lacked detailed knowledge of benefits covered. Some knowledge about the generosity of health insurance coverage (and other fringe benefits) is essential if employees are to effectively trade off benefits for money wages.

EXPENDITURES FOR EMPLOYEE COMPENSATION, 1972

A 1972 BLS survey of firm compensation practices provides data on employers' expenditures for various categories of benefits and for wages (BLS 1975). The survey, a stratified probability sample of establishments covered by state employment insurance laws, included 5031 firms. The strata are classified by industry, location, and number of employees, with the probability of inclusion in the sample roughly proportional to employment size.

LEVEL OF BENEFITS SURVEY

The 1979 Level of Benefits (LOB) Survey (BLS 1980a) also contains data on fringe benefits. The LOB data were collected by the Bureau of Labor Statistics in 1979 as a pilot survey. The survey, conducted for the Office of Personnel Management, will be used to develop cost

estimates for providing federal employees' benefits comparable to those in private industry.

While the LOB and HIE fringe benefits surveys occurred within a relatively short time-span, the LOB sample differs in several ways from the HIE sample. The LOB obtained information from 1253 large establishments in the continental United States. Establishments with few employees (the minimum number of employees varied between 50 and 250, depending on the industry) were not surveyed. Responding establishments were asked to provide benefits data for three classes of workers: professional-administrative, technical-clerical, and production. The LOB survey excluded executive management employees, and part-time, seasonal and temporary employees.

The HIE sample, by contrast, was defined as including employed individuals who were enrolled in the HIE, and therefore subject to its sampling rules. The data represent plans applicable for a given individual. No exclusions were made on the basis of occupation, part-time employment, or establishment size. The HIE data can be aggregated to the occupation categories in the LOB for comparison. However, because of the noted differences between the two samples, the data obtained from the two sources may not correspond exactly.

IV. EMPIRICAL ESTIMATES

FRINGES AND WAGES IN A NATIONAL SAMPLE

We begin by examining the importance of fringe benefits in total compensation for a national sample. Table 1 presents data on average hourly wages and benefits for office and nonoffice workers. The data are averages over the 4632 firms who reported complete information, and have been weighted to be representative of covered employees in these industries nationwide. The nominal wage for working hours reflects the usual use of the term "wage rate"--that is, direct payments for hours worked. It includes payments for shift differentials but does not include overtime pay. Wage rates were calculated by dividing employer expenditures for time worked by the number of hours.

Hourly benefits were calculated by dividing each employer's expenditures on benefits by the number of hours worked. Employer payments for health, life and accident insurance accounted for 2.0 percent of office employees' total compensation, and 1.9 percent of that of nonoffice employees. Including vacation pay, pensions, unemployment insurance, and Social Security payments, office workers gained, on average, $1.02 per hour and nonoffice workers $.59 per hour from the various fringe benefits.

In spite of the substantial increase in compensation per hour represented by fringe benefits, the correlation of total compensation (wages plus fringes) with base wage rate is 0.98. However, as wages increase, fringe benefits grow as a fraction of total compensation, as seen by the positive correlation between wages and percentage of

Table 1

HOURLY WAGES AND BENEFITS OF OFFICE AND NONOFFICE WORKERS--1972[a]

Item	Office Workers		Nonoffice Workers		Correlation Between Nominal Wage and Ratio of Benefit to Nominal Wage
	$/Hr	%	$/Hr	%	
Nominal wage for working hours	4.94	82.9	3.18	84.4	
Vacation	.46	7.7	.17	4.5	.15
Pension	.16	2.7	.06	1.6	.30
Social Security	.20	3.4	.17	4.5	-.59
Unemployment	.08	1.3	.12	3.2	-.22
Insurance	.12	2.0	.07	1.9	.15
Total compensation	5.96	100.0	3.77	100.0	.15

SOURCE: Calculated from BLS, 1975.

[a]Office employees are defined as: all employees in executive, administrative and management positions, above the working supervisory level. Also supervisory and nonsupervisory professional employees and their technical assistants; office clerical workers; and salespersons whose sales activities are primarily performed outside of the establishment (e.g., real estate salesmen, door-to-door salesmen).

Nonoffice employees are defined as: all employees, except office employees in nonsupervisory, nonprofessional positions. Includes employees engaged in fabricating, processing, assembling, building, mining, repairing, warehousing, trucking, retail sales, etc. Proprietors, members of unincorporated firms, and unpaid family workers are excluded from the survey.

compensation accounted for by fringe benefits. Column 3 shows the correlation across firms in the 1972 BLS Survey of nominal wages with the ratio of fringe benefits to nominal wages. This correlation coefficient is subject to negative bias if there are errors in measuring benefits or wages. Thus it is noteworthy that there is a positive correlation (0.15) between the share of all fringe benefits and base wage rates.

As postulated above, benefits increase as a share of total compensation at higher productivity levels. However, it appears that nontaxable as well as taxable benefits increase with productivity. The share of nontaxable private pensions in total compensation is more highly correlated with wages (0.30) than the share of taxable leave time (vacation, holidays, sick leave and personal leave). Both leave time's share and that of insurance benefits are correlated 0.15 with nominal wages. Benefits mandated by law--such as employer contributions to Social Security and unemployment insurance--account for a smaller share of wages at higher compensation levels, largely because there is a ceiling on the income subject to employer and employee taxes. In general, however, benefits represent a larger share of compensation at higher wage levels. To see whether this leads to underestimates of rates of return, we turn to data from the Health Insurance Experiment.

CHARACTERISTICS OF FRINGE BENEFITS DATA

In order to assess the quality of the HIE fringe benefits data, we begin by comparing fringe benefits data collected by the HIE in 1978 with the 1979 Level of Benefits (LOB) Survey (BLS 1980a). The benefit

rates reported in the LOB tend to exceed the rates in the HIE because LOB excludes seasonal and temporary workers, smaller employers, and lower wage jobs. The percentage of employees covered by life insurance is similar in the two surveys, but the percentage covered by health insurance is lower in the HIE. While LOB reports that 96 percent of full-time employees receive health insurance benefits, HIE data indicate 87 percent do so. The HIE number matches well with National Center for Health Statistics (NCHS) data, which show 86 to 91 percent of workers in firms with health insurance plans. The same document shows that over 90 percent of employees in firms with more than 25 workers have health insurance plans available, while only 55 percent of workers in firms with 25 or fewer employees do (Taylor and Lawson 1981, p. 4). The exclusion of smaller employers and part-time workers causes the LOB estimates to exceed the average for all firms and workers. This is a probable explanation for the reported differences in paid vacation and sick leave. The HIE data seem to correspond well to national data, where the comparison group is similar, as in the NCHS survey.

The multivariate analysis will use only data on full-time workers, but we can use the HIE data to determine how the various benefits vary with part-time/full-time status. Table 2 shows that fewer than half of the HIE sample part-time employees receive each of the benefit types, except health insurance. The percent of the HIE sample of full-time employees receiving benefits is nearly twice as high as for part-time in each category except sick leave and health insurance.

Table 2

BENEFITS OF PART-TIME AND FULL-TIME EMPLOYEES

	Percent Receiving Benefit		
	Part Time	Full Time	
Benefit	HIE[a]	HIE[a]	LOB[b]
Sick leave	36%*	47%	56%
Paid vacation	30%*	56%	100%
Accident insurance (noncontributory)	43%*	79%	55%[c]
Life insurance	31%*	73%	77%
Health insurance	75%*	87%	96%

[a]HIE data from 1978 Sick Leave Abstraction and Periodic Employment Reports (III for Dayton, IV for other sites).

[b]BLS, Employee Benefits in Industry: A Pilot Survey, Table 1, p. 4.

[c]Accident and sickness insurance, noncontributory.

[d]HIE data based on a subsample at Baseline.

*Differences between HIE full- and part-time employees significant at the 0.001 level.

Table 3 shows that even among full-time employees, benefits vary by race and sex. The top panel shows the percentage of employees that received benefits of various types. The bottom panel shows the wage increase implied by two types of benefits: health insurance and vacation. These two fringe benefits are the only ones where the HIE data have actual employer expenditures. Female employees were significantly more likely to receive paid sick leave and vacation than male employees, while men were more likely to receive both accident and life insurance. Male and female workers were equally likely to receive health insurance through their employment. Black-white differences should be interpreted with caution, however, since blacks accounted for only 4 percent of the sample. Further, a majority of the blacks in our sample resided in South Carolina, where all workers have lower benefit levels. Given these interpretive caveats, the data show that white workers in our sample were more likely to receive sick leave, accident and life insurance, but no more likely to receive health insurance or paid vacation.

The bottom panel of Table 3 shows the percentage increase in compensation due to employer-paid health insurance premiums and to paid vacation and holidays. For full-time workers in this sample, paid vacation added 3 percent to men's salaries and 4 percent to women's. Thus women were not only more likely to receive vacation, but also had a significantly greater share of compensation as vacation benefits. Including paid holidays makes the differences appear even larger, since even among full-time workers, men have longer average work weeks than women. These numbers correspond well to the 6.1 percent of compensation

Table 3

BENEFITS OF FULL-TIME EMPLOYEES BY RACE AND SEX

Benefit	White	Black	Male	Female
Percent Receiving Benefits				
Sick leave	47[a]	34	40[b]	60
Paid vacation	57	44	53[a]	62
Accident insurance	81[c]	47	84[b]	70
Life insurance	73[c]	53	75[d]	68
Health insurance	87	85	87	86
Number of observations (first 4 benefits)	856	32	587	301
Number of observations (health insurance)	443	21	165	299
Percentage Increase in Compensation Due to Benefit				
Employer-paid health insurance	*(e)*	*(e)*	4.4	4.5
Paid vacation	3.4	2.5	3.0[b]	4.0
Paid vacation plus holidays	6.1[c]	5.0	5.5[b]	7.2

[a]Difference between whites and blacks is significant at 10% level. However, these differences may be peculiar to our sample (see text).

[b]Difference between males and females is significant at 1% level.

[c]Difference between whites and blacks is significant at 1% level. However, these differences may be peculiar to our sample (see text).

[d]Difference between males and females is significant at 5% level.

[e]Insufficient observations to compute.

attributable to vacations and holidays in 1977 reported by the BLS (1980b). The percentage increase in wages attributable to health insurance, for those who had health insurance, is 4.4 percent for men and 4.5 percent for women. When we allow for the fact that not all workers have health insurance benefits and that life and accident insurance premiums are likely to be small, this number is quite consistent with the 4 percent of employers' expenditures for life, accident and health insurance (BLS, 1980b). Thus the HIE data are quite comparable to national averages.

The differences by race and sex indicate that significant variation exists within the group of full-time employees. Table 3 shows that at least in terms of sick leave and vacation, women are more likely to receive benefits than men. To see whether this offsets some of the male-female differential in direct monetary compensation, we must use multivariate methods to control for productivity differences. Because of the richness of complementary data on wages and demographic characteristics, we should be able to determine to what extent employees trade off wages and benefits.

MULTIVARIATE ANALYSES

In this section hedonic wage functions are estimated. We expect a negative relationship between wages and benefits if productivity is effectively held constant. A single equation method such as this does not capture the simultaneous nature of the wage-benefit tradeoff. However, it does solve a data problem posed by having employer costs for some benefits, but only a dichotomous indicator of whether benefits were received for others.

Table 4 presents regressions for the entire sample of full-time employees (those who worked 35 hours or more a week) for whom wage and fringe benefits data referred to the same employer. Regressing the log of hourly earnings on the usual productivity measures, we find that the implied rate of return to schooling is 4.1 percent. The rate of return estimate falls in the low end of the range reported in the literature. However, there is some evidence that rates of return to schooling have been declining in recent years (Freeman 1977). A consumer price index as well as dummy variables for the sites are included in the regression, but not shown. This regression accounts for one-quarter of the variance in log hourly earnings.

Men's median earnings were estimated to be 49 percent greater than women's and union workers earn 17 percent greater wages. Separate regressions for men and women had significantly different sets of coefficients. ($F = 24.5$ with 14 and 580 degrees of freedom.) While the rates of return were similar, men's wages increased more with experience, and were positively related to union membership, while women's wages were not.

Previous studies have also found that labor-force experience yielded greater returns to men than to women (Mincer, 1976). Mincer concluded that close to half the wage differential between men and women could be attributed to higher rates of return to labor market experience for men.

Table 4

WAGE REGRESSIONS FOR FULL-TIME WORKERS

(t-values in parentheses)

Independent Variable[a]	(1) Log Hourly Wage: All	(2) Log Hourly Wage: Males	(3) Log Hourly Wage: Females	(4) Log Vacation Days	(5) Log Hourly Wage Plus Benefits[b]	(6) Log of After-Tax Wages Plus Benefits
Intercept	1.098 (7.94)	1.482 (9.35)	.997 (4.59)	-.330 (-.96)	1.114 (10.3)	1.004 (9.61)
Education (years	.041 (6.67)	.041 (5.33)	.043 (4.31)	.067 (4.24)	.043 (8.79)	.038 (7.99)
Experience (years)	.009 (1.48)	.0154 (2.07)	-.003 (-.31)	.022 (1.50)	.021 (4.44)	.018 (3.95)
Experience squared (years x 10^{-2})	-.006 (-.42)	-.017 (-.99)	.012 (.57)	-.023 (-.66)	-.036 (-3.42)	-.033 (-3.20)
Sex	.399 (9.29)			.081 (-.74)	.367 (11.1)	.370 (11.60)
Union	.127 (2.73)	.151 (2.65)	.058 (.73)	-.272 (-2.27)	.146 (4.18)	.133 (3.93)
R^2	.25	.17	.16	.07	.38	.36
Number of observations	595	389	206	595	595	515

[a] Price level and sites were also controlled in the regressions.

[b] After-tax regression has smaller sample because of missing income-tax forms.

A significant share of employees' fringe benefits is in the form of paid vacation. What does the "vacation earnings function" look like? Column 4 in Table 4 shows how the log of vacation days is related to productivity determinants. Vacation days increase significantly more rapidly with education than do money wages, even though there is no tax advantage in receiving vacation pay. This result is consistent with the finding from the 1972 data reported in Table 1. Union status is associated with shorter paid vacations, but higher wages. In contrast to the results for money wages, sex does not affect vacation benefits significantly, once experience and other factors are accounted for.

How would the rate of return to schooling be affected by including compensation in the form of fringe benefits in total compensation? The wage data used in columns 1-3 were augmented to account for the implicit increase due to vacation pay, for sick leave (based on the sex-adjusted average number of days lost from work due to sickness by men and women), and on price-adjusted, occupation-specific expenditures for health, life, and accident insurance, given that an individual received insurance. The regression, shown in column 5, explains a substantially greater percent of the variance of wages plus benefits than of wages alone. Hourly wages, including vacation pay, sick leave, and insurance, averaged $6.70 compared with $6.25 before benefits were added, an increase of 7 percent. This increase falls within the range reported above for office and nonoffice workers.

If a greater percentage of compensation is given in the form of benefits to workers with certain characteristics (those with more education or experience, for example), then earnings functions which

excluded benefits would bias the coefficients of these variables. The difference between coefficients in columns 1 and 5 was never statistically significant.

However, the greater effect of unions in the wages plus benefits equation is consistent with the literature. Freeman (1981) finds that unionism raises the proportion of compensation which is received in the form of pensions, vacation pay, and life, health, and accident insurance.

The lack of significant differences between the wage equations with and without benefits indicates that omitting benefits would not lead to significant bias. The benefits accounted for here are largely taxable, and the correlations using BLS data show these rise less rapidly with productivity than nontaxable benefits. However, the omission of taxable benefits from earnings functions does not lead to significant bias in rate of return to schooling estimates, or to male-female or union-nonunion comparisons.

In the sixth column of Table 4 the family marginal tax rate (derived from data on actual income taxes paid) and Social Security tax rate are applied to wages to obtain an earnings function for after-tax wages plus benefits.

When the significance of the difference in coefficient vectors between equations 5 and 6 is then tested, we find that failing to account for tax rates does impart a bias to both the education and labor market experience coefficients. The rates of return to schooling and experience appear to be significantly more positive when marginal tax rates are ignored. The bias amounted to a difference in the rate of return of 0.5 percent. This finding is subject to the caveat that the

highest income families (who thus faced the highest marginal tax rates) were not in the sample. The ratio of after-tax wage plus benefits to hourly wages (e.g., comparing equations 6 and 1) is not significantly related to either education or experience, since the positive effect of schooling on benefits is counterbalanced by the negative relationship of schooling and the percentage of income which is retained after taxes.

Using this basic earnings function framework, we next estimate a hedonic wage function to determine in what way employees trade off wages for benefits. Table 5 presents hedonic wage equations in which benefits are added to the basic earnings function. There are four dummy variables indicating whether or not benefits are received. If employees are trading off wages for benefits, we expect these benefit variables to have negative signs. Receipt of paid vacation, sick leave, and accident insurance is associated with lower wages, but only vacation benefits lower wages significantly. However, the receipt of life insurance is positively related to wages. While not receiving any vacation or sick leave is compensated by higher wages, among those who do receive the benefit, wages are positively related to the amount of benefit received.

The LOB study gives a clue as to why this happens. Their data show that within occupation types, the number of vacation days and sick leave days increases with years of service (BLS 1980, pp. 5 and 6). But wages also increase with years of service or experience. Borjas (1981) found

Table 5

HEDONIC WAGE EQUATIONS FOR FULL-TIME WORKERS

(t-values in parentheses)

Independent Variables[a]	Dependent Variable: Log Hourly Wage			
	All Full Time	Full-Time Males	Full-Time Females	Sample with Health Insurance
Education	.04 (5.60)	.04 (4.49)	.04 (3.48)	.07 (2.90)
Receives vacation	-.34 (-1.97)	-.44 (-1.78)	-.34 (1.46)	.19 (.26)
Receives sick leave	-.12 (-.80)	.01 (.06)	-.31 (-1.29)	.31 (.59)
Receives accident insurance	-.04 (-.72)	-.05 (-.54)	-.07 (-.89)	.02 (.09)
Receives life insurance	.15 (2.66)	.19 (2.61)	.10 (1.29)	.10 (.56)
Log of annual vacation days	.15 (2.22)	.18 (1.95)	.11 (1.26)	-.05 (-.18)
Log of annual sick leave	.04 (.73)	-.03 (-.40)	.19 (1.87)	-.22 (-1.03)
Log of health insurance premium				.14 (1.50)
R^2	.26	.17	.15	.12
Number of observations	595	389	206	136

SOURCE: HIE data.

[a]Prices, sites, experience, experience squared, and union status were also controlled for.

that workers with greater employer-specific tenure had significantly higher wages at later ages. While the regression controls for labor-market experience, it does not perfectly control for years of service with a given employer. Thus the unobserved variable, years of employer-specific experience, which is positively related to both wages and vacation and sick leave benefits, biases the continuous benefit coefficients.

Separate regressions for men and women were found to differ significantly from each other. Both men's and women's wages react similarly to vacation benefits, but they differ in the response to sick leave. Sick leave has little effect on men's wages. For women, however, receiving any sick leave is compensated by lower wages, but among women who receive sick leave, higher-wage women receive more. Sick leave may have greater importance for women because of greater sickliness or because of their responsibilities for sick children. Whereas 5.1 percent of women employed full time lost time from work due to illness in May 1978, only 3.4 percent of men employed fully were absent from work in that month. This represented a loss of 2.8 percent of working time for women and 2.1 percent for men, since men had lengthier absences for each incidence (Taylor 1979, p. 57). Table 3 also showed that women were significantly more likely than men to receive any sick leave.

The regressions suggest that there are jobs with benefits and those without benefits. Jobs that provide no benefits generally offer higher wage rates. Thus workers can be thought of as regular employees receiving benefits or as working on contract to provide certain

services, without receiving benefits. However, among employees who receive benefits, the amount of these benefits is positively related to wages. This may occur because an unobserved job tenure variable relates wages and benefits indirectly, or because the benefit is tied directly to wage levels. The LOB reports, for example, that 63 percent of the job-related life insurance plans insure employees for a multiple of their earnings rather than for a flat amount or one based on years of service (BLS 1980, p. 14).

One of the most costly benefits is health insurance. The last column of Table 5 presents some results using the smaller sample on which health insurance benefits are available in the HIE sample. The health insurance variable is a measure of the amount the employer paid for health insurance. There are only 136 observations for this regression because data were only available for a subsample of HIE participants, and because workers who had changed jobs in the interval between the collection of health insurance data at Baseline and the collection of wage data in 1978 were eliminated from the sample. Although the coefficients lack precision because of the small sample size, it is clear that employer-paid premiums are positively rather than negatively related to wages.

V. CONCLUSIONS

Fringe benefits data from the HIE showed that there are significant differences by sex and race in the probability of receiving benefits. However, there was no evidence in the multivariate analyses that omitting benefits from earnings functions would systematically affect comparisons among sex or union groups.

Hedonic wage equations showed that employees earned compensating differentials when benefits were not provided on the job. However, among those receiving any benefits, the level of benefits was positively related to wage rates. While both men and women who did not receive vacation have higher wages, men seem not to pay any significant price in terms of lost earnings for receiving sick leave. Accident insurance affected wages insignificantly for both groups, perhaps because the total expenditure is small. Life insurance was positively related to wages. In the subsample for whom health insurance data were available, the amount of employer-paid premiums was positively related to wages.

These results indicate that lack of data on employee-specific taxable benefits does not greatly bias either rate of return estimates or earnings comparisons between men and women. Accounting for marginal tax rates had a greater effect on rates of return than accounting for fringe benefits. However, comparisons with LOB employer-supplied data shows that it is nonetheless true that benefits vary with employee characteristics. For comparisons of relative earnings, lack of benefits data does not seem crucial. However, the exclusion of nontaxable benefits, such as pensions, which rise more rapidly than taxable

benefits with earnings, may pose a problem for relative earnings comparisons. While for relative wage comparisons, taxable fringe benefits have little effect, for comparison of absolute total compensation, ignoring benefits would lead to underestimates.

The exclusion of part-time and seasonal employees from national benefits surveys may result in underestimates of fringe benefits coverage among workers. One way employees may choose a package of low benefits is to choose to work part time, since many employers pay benefits only to full-time employees. Thus, total compensation may have a discontinuity at the number of hours at which an employee becomes eligible for benefits.

More realistic models of labor supply should incorporate fringe benefits as part of the compensation for work, and acknowledge explicitly that hours worked respond to the discontinuity in compensation schedules due to providing fringe benefits only for full-time employees. The results presented here indicate that employees do trade off wages for the option to receive benefits. Surely, this option affects hours of work as well.

NOTES

1. We assume six paid holidays per year, in order to compare HIE data with data in BLS 1980b.

2. The price index used is based on BLS data (BLS 1978) on the autumn cost of living for an urban intermediate family of four in 1975-1978, and on price data collected by the HIE. It is documented in an unpublished Rand working paper by Willard G. Manning and Naihua Duan. Only two of our sites (Dayton and Seattle) coincided with sites used by BLS. Because the remaining sites were not specifically reported in BLS data, in all sites we sampled prices for a subset of 33 items in the BLS list of more than 400 items. The data for Dayton and Seattle, where both sets of estimates were available, were used to calibrate HIE cost of living to BLS cost of living estimates. The constructed indices were validated by comparing the HIE price index with data for available BLS sites (comparing Fitchburg, Massachusetts site with Boston, Franklin County, Massachusetts with North East Non-Metropolitan, Charleston with Atlanta, Georgetown County, South Carolina with Southern Non-Metropolitan).

3. Since the two dependent variables are regressed on the same set of independent variables, the appropriate test involves restricting some or all of the two sets of coefficients to be identical in the two regressions. The F value is 4.12 for the education variable, with 1 and 586 degrees of freedom, which is significantly different from zero at better than the 5 percent level. An equivalent test involves regressing the differences between the two dependent variables on the set of

independent variables. Since the dependent variables are in logs, this is equivalent to the log of the ratio

$$\ln W - \ln V = \ln\left(\frac{W_2}{V}\right) = f(X_i)$$

where W and V = are the wage rates and vacation days, respectively, and X are the independent variables. A significant education coefficient indicates the ratio of wages to vacation falls with education, implying vacation rises more rapidly with education than wages do.

4. To estimate sick leave taken, as contrasted with the maximum entitlement reported in the HIE data, the mean number of days of sick leave taken by male and female workers nationally was used (Taylor 1979, p. 51). Price adjustment was by means of the price index described in Note 1. Mean expenditures for life, health, and accident insurance in occupations were calculated from BLS 1975 and matched by occupation to the sample data if the individual received such employer-paid insurance.

5. The test described in Note 2 was used. The F value was 0.71, with 8, 586 degrees of freedom, which is not significant at the 5 percent level. It is, however, difficult to find significant differences when comparing with the raw wage rate equation, which lacks statistical precision.

6. The F value was 12.5 with 26 and 502 degrees of freedom.

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