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Do Workers Accept Lower Wages in Exchange for Health Benefits?

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Compensating wage theory predicts that workers receiving more generous fringe benefits are paid a lower wage than comparable workers who prefer fewer fringe benefits. This study tests this prediction for employer-provided health insurance by modeling the wages of married women employed full-time in the labor market. Husband's union status, husband's firm size, and husband's health coverage through his job are used as instruments for his wife's own employer health insurance benefits. The estimates suggest wives with own employer health insurance accept a wage about 20% lower than what they would have received working in a job without benefits.

I. Introduction

Who pays for employer-provided health insurance? Standard compensating wage theory predicts that workers differ in their demand for employer-provided benefits and sort themselves across firms so that the mix of wages and fringe benefits matches their preferences. Holding human capital and other variables influencing wages constant, workers who receive more generous fringe benefits are paid a lower wage than comparable workers who prefer fewer fringe benefits (Rosen 1986). This theoretical framework predicts that, in a correctly specified wage regression, the coefficient on a variable measuring whether a worker is covered by health

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insurance through his or her job will be negative and the estimated coefficient on the health insurance variable reflects the average market value of employer-provided health insurance to workers. While the theoretical prediction is clear, empirical evidence confirming this prediction has been elusive. As Currie and Madrian (1999, p. 3372) note in their recent review, "the empirical validity of [the wage-health insurance trade-off] has been difficult to establish. The typical estimates . . . are either wrong-signed, insignificant, or both. The literature has thus focused not on the magnitude of the wage-health insurance trade-off, but on the reasons why economists cannot find evidence that there is one."

A strategy for obtaining unbiased estimates of the effect of health insurance on labor market behavior is to identify one or more variables that are correlated with health insurance coverage but uncorrelated with unobserved factors affecting wages and to use these variables as instruments to "purge" the health insurance variable of its correlation with the error term in the wage equation. This strategy is used in this study to estimate the wage-health insurance trade-off for wives employed full-time. The innovation in this study is the use of two instruments correlated with employed wives' health insurance coverage but arguably independent of unobserved factors affecting the wages of employed wives after conditioning on a set of observable characteristics of the husband and wife. The two instruments are husband's firm size (number of employees) and his union status. These two variables are correlated with whether employed wives have health insurance through their jobs because of an indirect effect each variable has on whether husbands have health insurance benefits through their jobs. Husbands working in small firms or in nonunion jobs are less likely to have health insurance through their jobs, and this increases the probability that their wives have a job with health insurance through their own employers.

Using health insurance coverage data from the March Current Population Survey (CPS) for 1990–93, the two-stage least squares (2SLS) estimates using the two instruments show that wives with health insurance earn an average hourly wage that is about .20 log points lower than the wage they would have earned if they were employed on a job without health insurance. The two instruments overidentify the wage model and permit a formal test of the hypothesis that the set of instruments are exogenous to the error terms in the second-stage wage equation (Newey 1985). The instruments pass this test at conventional levels of significance.

Estimates of the market value of health insurance coverage are also obtained using data from the 1993 Fringe Benefit Supplement to the April 1993 CPS. This sample, which is substantially smaller than the 1990–93 sample, produces point estimates close to those obtained from the March 1990–93 sample but with much larger standard errors. The April 1993 data distinguish eligibility for health insurance coverage through an employer and acceptance of health insurance by an employee. While most wives working full-time who are eligible for health insurance coverage accept coverage, a majority of wives working full-time without coverage are eligible for coverage through their employer but voluntarily decline coverage because of spousal benefits. The point estimates from the April 1993 data suggest that, among wives eligible for coverage, those women who accept coverage earn a lower wage relative to women who decline the coverage. Finally, the dollar value of the estimated wage-health insurance trade-off is very close to the average expected health care costs paid for by health insurance calculated from the 1987 National Medical Expenditure Survey (U.S. Department of Health and Human Services 1997) and self-reports from a Gallup poll where workers were asked the additional pay they would need to voluntarily give up their health insurance benefits. These comparisons suggest that the results are plausible estimates of the market value of employer-provided health insurance coverage.

The remainder of the article is organized as follows. Section II discusses alternative empirical strategies for estimating the wage-health insurance trade-off. Section III describes the data and presents the relationship between the instruments and a wife's own employer health insurance coverage. Section IV presents the reduced form and instrumental variables (IV) estimates of wives's wages, and Section V discusses alternative estimates of the wage-health insurance trade-off using the April 1993 CPS-Fringe Benefit Survey. Section VI compares the IV estimates of the value of health insurance with estimates of health care costs. Concluding remarks and a summary are provided in Section VII.

II. Estimating the Value of Health Insurance to Workers

Standard compensating wage theory applied to health insurance predicts that workers differ in their demand for employer-provided benefits and sort themselves across firms so that the mix of wages and fringe benefits match their preferences. Holding human capital and other variables influencing wages constant, workers who receive more generous fringe benefits are paid a lower wage than comparable workers who prefer fewer fringe benefits (Rosen 1986). The standard illustration of this prediction is given in figure 1, where workers maximize their utility subject to a budget constraint defined by their human capital and ability levels. Workers sort across firms offering different wage and health insurance combinations along the S_1 budget constraint, based on their preferences. Worker A prefers a compensation package without any health insurance and an hourly wage of W_2, while Worker B accepts a job that provides a wage of W_1 and health insurance costing HI per hour. Ignoring the tax treatment of employer-provided health insurance benefits and assuming

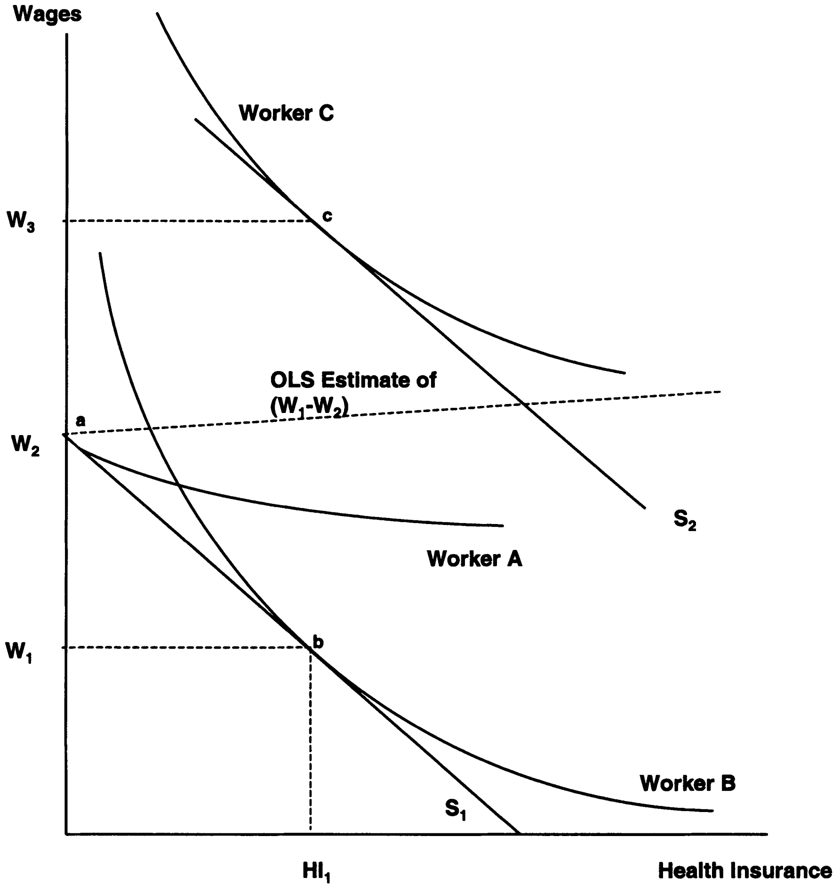

FIG. 1.— The wage-health insurance trade-off

there are no productivity-altering effects attributable to providing health insurance to employees, the slope of S_1 is -1.

A naive method for estimating $(W_1 - W_2)$, the market value of health insurance, is to estimate a wage regression using a sample of workers, where WOWNHI is a dummy variable equal to one if the worker has health insurance coverage through his or her job, and zero otherwise:

$$\ln W_i = \beta_0 + \beta_1 \mathrm{WOWNHI}_i + \mathrm{X}_i\beta_2 + \varepsilon_{1,i}. \qquad (1)$$

Even with a reasonable set of control variables, the ordinary least squares (OLS) coefficient on WOWNHI is typically positive. For example, a value of .146 (SE = .007) is obtained for β_1 when the estimation is done using this study's pooled 1990–93 CPS extract of married women employed full-time. This coefficient is biased, and the positive sign suggests that unobserved factors affecting wages that are correlated with WOWNHI more than offset the trade-off between wages and health insurance predicted by the theory. This is illustrated in figure 1, where Worker C appears comparable with the workers based on observable variables, but where Worker C is actually more highly skilled and receives higher total compensation relative to workers A and B. With the three data points (*a*, *b*, and *c*), the OLS estimate of $(W_1 - W_2)$ is shown by the dotted line in figure 1, and it is biased upward.

A strategy for obtaining unbiased estimates of the effect of health insurance on labor market behavior is to identify one or more variables that are correlated with WOWNHI but uncorrelated with ε_1. These instruments can then be used to "purge" the health insurance variable of its correlation with the error term in the wage equation. Figure 1 provides a clue about a set of variables that might successfully serve as instruments for WOWNHI in equation (1). I hypothesize that the choice married women make between jobs with and without health insurance depends on the availability of health insurance through their husbands' jobs. A husband's health insurance benefits will be an important factor in the woman's decision making if her utility depends on the welfare and health of the entire household and if health insurance benefits through one job are more highly valued than the marginal utility of coverage from a second job. Under these conditions, a wife is more likely to prefer job *b* in figure 1 and to accept the wage reduction to acquire health benefits when her husband lacks insurance through his job. On the other hand, where a husband has health insurance benefits through his job, she is more likely to prefer the higher wage pay of job *a*.

More formally, the probability that an employed wife is not at a corner solution without health benefits is a function of her husband's benefits,

$$\Pr(\mathrm{WOWNHI}_i = 1) = C_0 + Z_i^W C_1 + C_2(\mathrm{HHI}_i) + \varepsilon_{2i}, \qquad (2)$$

where HHI_i equals one if the husband has health insurance through his job, and zero otherwise; Z_i^W is a vector of measured variables other than spousal health benefits affecting his wife's demand for health insurance through her jobs; ε_{2i} is an unobserved error term, and C_2 is hypothesized to be less than zero.

A single equation estimate of C_2 in equation (2) is likely to be biased for two reasons. First, it may overstate the responsiveness of wives' benefit packages to the benefit packages of their husbands if the health benefits wives receive through their jobs cause some husbands to accept employment without health benefits. This potential simultaneity implies a negative correlation between HHI and ε_2 that will bias the linear probability model estimate of C_2 away from zero and overstate the negative effect of a husband's benefits on the probability that his wife has benefits through her job.

Second, the estimate of C_2 may be biased because of positive assortive mating along unobservable variables that are correlated with each person's demand for a job with health insurance. If the unobserved components of ability or skill that affect the total compensation of husbands and wives are correlated through assortive mating, then couples with greater unobserved earnings potential are also likely to demand more and better health insurance because of an income effect. This will cause some high-income couples to choose dual or overlapping coverage from each of their jobs and cause some low-income couples to go without coverage on both jobs because of their low unobserved abilities. This assortive mating implies a positive correlation between HHI and ε_2 that will bias single-equation estimates of C_2 toward zero and understate a negative causal effect of husbands' benefits on Pr(WOWNHI = 1).

One instrumental variable strategy for estimating β_1 in equation (1) is to instrument WOWNHI using equation (2) and HHI as the identifying instrument. Let $\beta_1^{IV=HHI}$ equal this instrumental variable estimator of β_1 using HHI as the instrument. For the reasons discussed above, it is unlikely that $\beta_1^{IV=HHI}$ will provide an unbiased estimate of β_1. If HHI is positively correlated with ε_2 in equation (2) because of positive assortive mating, then HHI will also be positively correlated with ε_1 in equation (1). High-ability wives are likely to be employed in jobs with health insurance coverage and higher wages and to be married to husbands who are also likely to have health insurance coverage through their jobs. A positive correlation between HHI and ε_1 in equation (1) will generate an IV estimate of β_1 that will understate the size of the negative trade-off between wages and health insurance for married women.

An alternative to using HHI as an instrument for WOWNHI in equation (1) is to model husband's health insurance through his employer as a function of a set of exogenous variables, Z^H:

$$\Pr(HHI = 1) = D_0 + Z_i^H D_1 + \varepsilon_{3i.} \tag{3}$$

A valid instrument for WOWNHI in equation (1) is a variable in Z^H that is not included in equation (1) and is independent of ε_2 and $\varepsilon_{3.}$ Such a variable will be correlated with WOWNHI through its impact on HHI in equation (3) and the relationship between HHI and WOWNHI that is described by equation (2). If this variable is independent of ε_2 and ε_3, then it will also likely be independent of the error term in the wife's wage equation. Thus, this strategy involves the identification of one or more variables correlated with whether the husband has health insurance through his job that are correlated with the probability his wife has health insurance because of the relationship between HHI and WOWNHI described by equation (2).

The two variables in Z^H that are used as instruments for WOWNHI in equation (1) are the size (number of employees) of the firm the husband works for and his union status. Firm size is used as an instrument because small firms are significantly less likely to offer health insurance to their employees (Brown, Hamilton, and Medoff 1996; Currie and Madrian 1999) because of economies of scale in the purchase and administration of health insurance benefits. Firm size is measured using an indicator variable equal to one if the husband works for a firm with less than 100 employees, and zero otherwise. The theoretical reason for using union status as an instrument is the greater weight given to the intramarginal worker in the union firm relative to the nonunion firm which produces a greater preference among unionized workers for fringe benefits compared to wages. This prediction is supported by previous empirical research (Freeman 1981; Olson and Whittaker 2001), which shows a significant union/nonunion health insurance differential among males employed full-time.

What are the likely relationships between β_1 and the estimates using the different instruments? Positive assortive mating that generates a positive correlation between HHI and ε_1 may also cause husband's firm size or union status to be correlated with ε_1. This would occur if men with low unobserved productivity work for smaller firms or in nonunion firms without health insurance and marry women with low unobserved productivity who earn lower wages and are employed in jobs without health insurance coverage. In this case, positive assortive mating will generate an IV estimate of β_1 that is biased away from zero. Since compensating wage theory predicts $\beta_1 < 0$, this bias caused by assortive mating means $E(\beta_1^{\mathrm{IV=SIZE,\,UNION}}) < \beta_1 < 0$. On the other hand, as noted above, positive assortive mating will cause $\beta_1 < E(\beta_1^{\mathrm{IV=HHI}})$. In summary, if ε_1, ε_2, and ε_3 are positively correlated because of assortive mating, the instrumental variable estimates β_1 using the two sets of instruments will bound β_1:

$$E(\beta_1^{\mathrm{IV=SIZE,\,UNION}}) < \beta_1 < E(\beta_1^{\mathrm{IV=HHI}}). \tag{4}$$

The final point to note is that the potential bias from using only union status as an instrument is arguably smaller than the potential bias caused by using firm size as an instrument. Card (1996) finds that the selection bias in estimates of the union wage effect for male workers is not consistent over the skill distribution. He finds that workers who are low-skilled on dimensions observable to the researcher are positively selected into union jobs and higher-skilled workers are negatively selected into union jobs based on unobserved ability. This heterogeneity in selection effects implies that workers on union jobs are not uniformly less able on unobservable characteristics when compared with their nonunion counterparts, so that the potential bias caused by assortive mating may be smaller when union status is used as an instrument.

III. The Data and the First-Stage Estimates

The data used in this study are from the March–June 1990–93 Current Population Surveys (CPS). The March CPSs include questions on employer-provided health insurance and firm size. Union status and wage data are asked each month of respondents in the outgoing rotations group (ORG) subsamples. Therefore, the data were constructed by merging the March CPS with the ORG subsamples for April, May, and June for each of the 4 years. Respondents in each March survey in rotation groups 1, 2, and 3 were matched with the ORG files for, respectively, June, May, and April. March respondents in rotations groups 4 and 8 were also included because they were asked the unionization and wage questions in March. These merged March–June files were then split by gender and marital status and merged back together by household identifiers to produce a single record for each married couple. The files for the 4 years were then pooled and the analysis restricted to households where both the husband and wife were employed. The sample was then restricted to couples where the wife was employed full time (> 34 hours a week) and had an hourly wage greater than or equal to $2.00 an hour. These criteria produced a sample of 22,332 households.

The March CPSs used in this study do not provide detailed information about the health care paid for by employer-provided health benefits. All that is available on the CPS is an indicator variable measuring whether a respondent is covered by an employer-provided health plan and the person in the household whose job is providing the coverage. Three health insurance variables relevant to this study can be constructed from the March CPS. The first variable, HHI, is an indicator variable that takes on a value of one if the husband in the household is covered by a health plan through his employer, and zero otherwise. A second variable that can be constructed indicates whether the wife reports being covered by her husband's health insurance plan, and the third variable, WOWNHI, equals one if the wife is covered by a health insurance plan through her employer, and zero otherwise.[1]

[1] Unfortunately, in the March Current Population Survey, for the years used in this analysis, it is not possible to identify wives who were eligible for health insurance through their husband's employer but have chosen not to accept coverage. This ambiguity between eligibility and coverage creates several problems. A substantial fraction of wives in these households report not being covered by their husbands' benefits. However, most of these wives have benefits through their own employers and were probably eligible for coverage through their husbands' plan. Since I cannot distinguish between these households and households where wives are not eligible for coverage under their husbands' plans, I assume all women married to men who have coverage (HHI = 1) could have been covered by their husband's plans and, therefore, the wives most likely to seek a job with health benefits are those married to men without health benefits (HHI = 0). The

A necessary condition for HHI, husband's union status, and firm size to serve as instruments in equation (1) is for these variables to be correlated with WOWNHI after conditioning on other variables affecting LnW. Furthermore, it is expected that union status and firm size will be related to HHI if these variables are valid instruments for WOWNHI because of their effects on HHI in equation (3). Table 1 presents the simple cross tabulations between these different variables and suggests that each of the three variables are strongly related to WOWNHI and, therefore, potentially valid instruments for WOWNHI. Rows A and B show the relationship between HHI and firm size and union status. In this sample, union members had a probability of having health insurance benefits that is 20 percentage points larger than nonunion workers, and men employed in firms with 100 or more employees had a .83 probability of having health insurance. This compares with a probability of .54 in small firms. The last three rows show the relationship between the three instruments and WOWNHI. Wives married to men without health insurance were more likely to have own employer health insurance (.59 vs. .75); wives married to union members were less likely to have a job with health insurance (.59 vs. .65); and wives married to men working in small firms were more likely to have health insurance (.67 vs. .62). In all cases, the differences in proportions are significant with a p-value of .05 or lower.

Table 2 shows the first-stage linear probability estimates of the effects of HHI, union status, and firm size on wife's own employer health insurance, where each model includes an extensive set of exogenous variables that are included in the wage equation for wives. In each specification reported in table 2, the exogenous variables include four indicators of wife's education, a quadratic in wife's potential labor market experience, three region dummies, three race variables, wife's union status, wife's firm size, husband's annual earnings in the previous year, number of children under age 6 in the household, number of children aged 6–18 in the household, husband's annual earnings, three year dummies, and interactions between the year dummies and husband's income. In addition, the specifications in columns 5–8 control for husband's education and potential labor market experience. Husband's education and experience are included in the wife's wage equation (and therefore the first-stage equation for the IV estimators) to help ensure that the variation in WOWNHI that is identified by the three instruments and captured by the first-stage estimate is independent of the error term in equation (1).

The estimates in table 2 are very consistent with the unconditional differences reported in the last three rows of table 1 and show that the three variables are strong predictors of WOWNHI. The estimated effect

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analysis in Sec. V investigates the distinction between eligibility and coverage using data from the April 1993 Fringe Benefit Supplement to the CPS.

Table 1
The Distribution of Own Employer Health Insurance by Spouse's Coverage, Firm Size, and Union Status

	Probability Husband Has Own Employer Health Insurance		
	Member	Nonmember	Difference
A. Husband's union status	.900*** (.004)	.698*** (.003)	.202*** (.005)
	Small Firm (< 100 Employees)	Large Firm (≥ 100 Employees)	Difference
B. Size of husband's firm	.543*** (.006)	.832*** (.003)	−.289*** (.007)
	Probability Wife Has Own Employer Health Insurance		
	Husband Has HI (HHI = 1)	Husband Does Not Have HI (HHI = 0)	Difference
C. Husband has own employer health insurance	.594*** (.004)	.753*** (.006)	−.159*** (.007)
	Union Member	Nonmember	Difference
D. Husband's union status	.589*** (.007)	.648*** (.004)	−.059*** (.008)
E. Size of husband's firm	Husband Works for Small Firm (< 100 Employees)	Husband Works for Large Firm (≥ 100 Employees)	Difference
	.667*** (.006)	.621*** (.004)	.046*** (.007)

NOTE.—Estimated standard errors are in parentheses.
*** $p<.01$.

Table 2
First-Stage Linear Probability Estimates of the Probability Wives Have Own Employer-Provided Health Insurance

	Alternative Specifications							
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Husband's health insurance (HHI)	−.155***				−.156***			
	(.007)				(.007)			
B. Husband's union status (=1 if union member)		−.083***		−.065***		−.084***		−.066***
		(.008)		(.008)		(.008)		(.008)
C. Husband's firm size (= 1 if firm size < 100)			.093***	.082***			.092***	.081***
			(.007)	(.007)			(.007)	(.007)
D. Model includes husband's education and experience	No	No	No	No	Yes	Yes	Yes	Yes
R^2	.1247	.1106	.1135	.1163	.1256	.1116	.1143	.1171

NOTE.—Estimated White standard errors are in parentheses. In addition to the variables shown in the table, each model also includes four indicator variables for wife's education; a quadratic in wife's potential labor market experience; three region indicator variables; three indicator variables for wife's race, number of children under age 6, and number of children 6–18 years old in the household; wife's union status; wife's firm size; husband's annual earnings in the previous year; three year indicators; and interactions between the year dummies and husband's income.
*** $p<.01$.

of HHI on WOWNHI shows that wives married to husbands with health insurance are about 15.5 percentage points less likely to have health insurance through their own jobs. This differential is statistically significant and virtually identical to the unconditional difference reported in row C of table 1. With respect to both husband's union status and firm size, the absolute size of the coefficients on these variables in table 2 (e.g., cols. 2 and 3) are larger than the unconditional differences shown in table 1. The estimates in columns 4 and 8 show that women married to men who are union members are about 6.5 percentage points less likely to have health insurance and women married to husbands working in small establishments are 8 percentage points more likely to have health insurance through their jobs.

IV. The Reduced Form and Instrumental Variables Estimates of Wives' Wages

Table 3 reports the reduced-form estimates obtained by regressing the log hourly wage on the different instruments and an extensive set of controls. The coefficients in models using each of the instruments separately (cols. 1–3 and 5–7) are all in the predicted direction. Women married to men with health insurance through their jobs earn 1.6%–2.6% more per hour, presumably because the spousal health insurance allows these women to accept a higher-paying job because they do not need employer-provided health benefits. Likewise, women married to men employed in larger firms or in unionized jobs earn a slightly higher hourly wage because they do not need to accept the lower wage necessary to obtain health benefits for their family. When both union status and firm size are included in the model, the coefficient on husband's union status switches sign in one specification (col. 4) and is statistically insignificant in the other specification (col. 8). This reflects the fact that workers are significantly less likely to be unionized if they work for smaller employers.

Table 4 shows the ordinary least squares (OLS) and instrumental variables (IV) estimates of the effect of health insurance coverage on the wages of working wives. Column 1 reports the OLS estimate and shows, contrary to the theory but consistent with previous literature, that women with health insurance earn more than women without health insurance. Columns 2–4 and 6–8 report IV estimates using each of the instruments individually. Columns 5 and 9 report the 2SLS estimates using union status and firm size as instruments. Note that all of the IV estimates of the tradeoff between health insurance and wages have the negative coefficient predicted by compensating wage theory and that all of the point estimates except for the specification in column 4 are statistically significant from zero at the .05 level or better.

While all of the estimates reported in columns 2–9 have the correct

Table 3
Reduced Form Estimates of the Effects of Husband's Health Insurance, Husband's Union Status, and Husband's Firm Size on Her Ln(Hourly Wage) for Married Women Working Full-Time

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Husband has own employer health insurance (HHI)	.026***				.016***			
	(.006)				(.006)			
Husband's union status			.005	−.004			.014**	.008
			(.007)	(.007)			(.007)	(.007)
Husband's firm size		−.039***		−.039***		−.026***		−.025***
		(.006)		(.006)		(.006)		(.006)
Wife's wage model includes husband's education and experience	No	No	No	No	Yes	Yes	Yes	Yes

Note.—Estimated standard errors are in parentheses. In additon to the variables shown in the table, each wage regression also includes four indicator variables for wife's education; a quadratic in wife's potential labor market experience; three region indicator variables; three indicator variables for wife's race, number of children under age 6, and number of children 6–18 years old in the household; wife's union status; wife's firm size; husband's annual earnings in the previous year; three year indicators; and interactions between the year dummies and husband's income.
** $p < .05$.
*** $p < .01$.

Table 4
Ordinary Least Squares (OLS) and Instrumental Variables (IV) Estimates of the Effects of Wife's Health Insurance Coverage on Her Ln (Hourly Wage) for Married Women Working Full-Time

	Specification								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Wife's own employer health insurance (WOWNHI)	.141***	−.158***	−.380***	−.059	−.280***	−.101***	−.267***	−.162**	−.231***
	(.006)	(.038)	(.065)	(.079)	(.054)	(.038)	(.063)	(.079)	(.054)
Wife's wage model includes husband's education and experience	No	No	No	No	No	Yes	Yes	Yes	Yes
Estimator	OLS	IV	IV	IV	2SLS	IV	IV	IV	2SLS
Instruments for WOWNHI:									
Husband has own employer health insurance (yes or no)	NA	Yes	No	No	No	Yes	No	No	No
Husband's firm size	NA	No	Yes	No	Yes	No	Yes	No	Yes
Husband's union status	NA	No	No	Yes	Yes	No	No	Yes	Yes
Coefficient (SE) on predicted value of WOWNHI from first-stage regression when included in the second-stage equation		−.307	−.527	−.201	−.427	−.253	−.416	−.309	−.382
		(.036)	(.056)	(.077)	(.049)	(.037)	(.057)	(.074)	(.049)
Chi-square test of the exogeneity of the instruments					11.28				1.288
p-value					.0008				.256

NOTE.—Estimated standard errors are in parentheses. OLS = ordinary least squares; 2SLS = two-stage least squares; IV = instrumental variables. In addition to the variables shown in the table, each wage regression also includes a quadratic in wife's potential labor market experience; three region indicator variables; three indicator variables for. wife's race, number of children under age 6, and number of children 6–18 years old in the household; wife's union status; wife's firm size; husband's annual earnings in the previous year; three year indicators; and interactions between the year dummies and husband's income.

** $p < .05$.
*** $p < .01$.

sign, the estimated value of health insurance encompassed by the different estimates includes a substantial range from about 6% to 40%. Thus, the issue is whether some of these estimates can be rejected by the data. The first point to note is that the models in columns 5 and 9, which take advantage of two instruments—husband's firm size and union status—are overidentified and permit a formal test of the hypothesis that the set of instruments are exogenous to the error term in the wage structural equation (Newey 1985). In the specification that does not include husband's education and experience (col. 5), this null hypothesis is decisively rejected by the data ($p = .0008$). On the other hand, when the model includes husband's education and experience the p-value for the test is .256.

The different results for the overidentification test suggest that including the husband's education and experience in the wife's wage equation is important because it controls for variation in WOWNHI captured by the two instruments in the first-stage estimate that might otherwise be correlated with the error term in the wife's wage equation. Including husband's education and experience in the wife's wage equation even though these variables are not causally related to her wages is an illustration of the distinction between control variables and causal variables (Angrist and Krueger 1999). Since the overidentification test favors including husband's education and experience in the wage model, the specifications in columns 2–5, which lack these controls in the wage equation, are rejected in favor of the specifications in columns 6–9, which include these controls.

An important point to consider when selecting between the remaining estimates in columns 6–9 is to recall the earlier discussion about the direction of the bias introduced by assortive mating. The estimate in column 6 that uses HHI as an instrument is likely to be an underestimate of the average trade-off between wages and health insurance because of a positive correlation between HHI and ε_1. Two related tests were conducted to investigate the significance of this bias. First, a 2SLS model was estimated using all three instruments—HHI, firm size, and union status. As shown in column 9, the null hypothesis of independence is not rejected at conventional levels of significance using only firm size and union status as instruments. However, when all three variables are used as instruments, the estimate of β_1 is $-.137$ and the hypothesis that the set of three instruments are independent of ε_1 is rejected with a p-value of .03. This suggests that the estimate using HHI as an instrument understates the true negative trade-off between wages and health insurance.

The second test that I perform compares the estimate of the impact of HHI on WOWNHI (eq. [2]) from a linear probability model with the estimate of the same relationship that uses firm size and union status as instruments for HHI. If the linear probability and the 2SLS estimate of C_2 are different, then this indicates that HHI is correlated with ε_2 and is, therefore, likely to be correlated with ε_1. Estimates of the effect of HHI on WOWNHI for the different specifications are shown in table 5. The key point to note is that all of the IV and 2SLS estimates are very similar and they are over twice the size of the OLS estimates. The OLS estimate implies that the probability of a wife having health insurance through her job is reduced by .16 points when she is married to a husband who has health insurance benefits. The IV and 2SLS estimate show that the magnitude of this effect is about $-.34$ points when the correlation between HHI and ε_2 is controlled for using the two instruments. This is the direction of the bias predicted by positive assortive mating. Also note that the two instruments (specifications 4 and 8) marginally pass the overidentification test at the .05 level. These two tests lead to the conclusion that $\beta_1^{IV=HHI}$ is a lower-bound estimate of the true negative trade-off between wages and health insurance and that β_1 is a larger negative value than the $-.101$ estimate obtained when HHI is used as an instrument.

The estimates in columns 7 and 8 of table 4 that, respectively, use firm size and union status as instruments give slightly different estimates: $-.267$ when firm size is used as an instrument and $-.162$ when union status is used as an instrument. While there is nothing in the data that can be used to conclude which estimate is closer to β_1, recall that the bias using firm size as an instrument is likely to be greater than the bias introduced by using husband's unionization as an instrument as indicated by Card's (1996) work showing that the direction and magnitude of the selection bias into union jobs on unobserved ability varies over the skill distribution. If this heterogeneity in selection effects increases the likelihood that husband's unionization status is independent of the error term in equation (1), then the $-.162$ estimate may be preferable to the $-.27$ obtained when only firm size is used as an instrument. To summarize, the results suggest that $-.231 < \beta_1 < -.101$.

V. Alternative Estimates from the April 1993 Current Population Survey Fringe Benefit Survey

The data on health insurance coverage from the March 1990–93 CPSs are based on information on whether women in the sample are covered by health insurance through their own employers. Women who report being uncovered by health insurance from their employer could be uncovered because they work for employers who do not offer health insurance to any employees, they could be ineligible for health insurance offered by their employers, or they could decline coverage that they are eligible to receive. The analysis in the two preceding sections assumes that women without coverage for any of these three reasons receive higher wages relative to women who accept health insurance coverage from their employer.

Table 5
Ordinary Least Squares (OLS) and Instrumental Variables (IV) Estimates of the Effect of Husband's Health Insurance Benefits (HHI) on the Probability Wives Have Own Employer Health Benefits (WOWNHI)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Husband's own employer health insurance (HHI)	−.164***	−.344***	−.394***	−.356***	−.162***	−.340***	−.395***	−.354***
	(.007)	(.023)	(.036)	(.021)	(.007)	(.023)	(.036)	(.021)
Wife's health insurance model includes husband's education and experience	No	No	No	No	Yes	Yes	Yes	Yes
Estimator	OLS	IV	IV	2SLS	OLS	IV	IV	2SLS
Instruments for HHI:								
Husband's firm size	NA	Yes	No	Yes	NA	Yes	No	Yes
Husband's union status	NA	No	Yes	Yes	NA	No	Yes	Yes
Chi-square test of the exogeneity of the instruments				1.683				2.035
p-value				.195				.154

NOTE.—Estimated standard errors are in parentheses. OLS = ordinary least squares; 2SLS = two-stage least squares; IV = instrumental variables. In addition to the variables shown in the table, each model also includes four indicator variables for wife's education; a quadratic in wife's potential labor market experience; three region indicator variables; three indicator variables for wife's race; number of children under age 6, and number of children 6–18 years old in the household; wife's union status; wife's firm size; husband's annual earnings in the previous year; three year indicators; and interactions between the year dummies and husband's income.

*** $p < .01$.

It is impossible to estimate the wage trade-off incurred for accepting health insurance coverage among those women eligible for coverage using the March CPS data because the survey does not ask separate questions about eligibility and coverage. However, it is possible to investigate this issue using the Fringe Benefit Supplement to the April 1993 CPS. In this survey separate questions on health insurance eligibility and coverage were asked of a 50% subsample of currently employed respondents. Employed individuals in rotation months 3, 4, 7, and 8 were asked detailed questions about both health and pension benefits. Wage and union status information were collected in April for respondents in rotation months 4 and 8, and respondents in rotation months 3 and 7 were matched with survey data from May 1993 to obtain wage and union status information. In addition to separate questions on eligibility and coverage, the fringe benefit questions refer to the current job held by the individual, whereas the health insurance coverage questions in the March survey refer to the longest job held in the previous calendar year. Because of job and employer changes, this makes the quality of the match between health insurance coverage and wages better in the April survey than in the March data used in the earlier analysis.

A sample of couples from the April 1993 CPS was constructed using the same method used to create the 1990–93 March sample. Records for husbands and wives were matched based on household identification codes. Couples were then dropped from the sample if the wife was over the age of 64, worked part-time (usual hours were < 35 hours per week), or if data were missing on the variable used in the analysis. This selection process produced a sample of 2,913 couples. This sample is substantially smaller than the sample of 22,332 couples in the March 1990–93 sample; therefore, the estimates from the April survey will be less precise.

The data from the subsample of households included in the April 1993 Fringe Benefit Supplement used in this analysis show that the distinction between health insurance eligibility and coverage is very important. Eighty-six percent of wives working full-time were eligible for health insurance coverage through their employer, and, among wives eligible for coverage, 78% accepted coverage. Thus, 67% of wives working full-time had employer-provided health benefits. Although most women accepted health insurance benefits if they were eligible, a majority (57%) of wives without coverage were eligible for coverage through their employer but declined coverage. Finally, spousal coverage appears to be quite important in the decision to decline available health benefits; 89% of wives eligible for own employer health insurance but who were uncovered reported they declined coverage because they were covered by another health insurance plan.

The first two columns of table 6 report the IV estimates for equation (1) using the entire subsample, and the variable WOWNHI in the wage

Table 6
Instrumental Variables (IV) Estimates of the Effects of Wife's Health Insurance Coverage on Her Ln(Hourly Wage) Using Data from April 1993 Consumer Price Index Fringe Benefit Supplement

	Total Sample (N = 2,913)		Wife Is Offered Health Insurance by Own Employer (N = 2,503)	
	(1)	(2)	(3)	(4)
Wife covered by own employer health insurance (WOWNHI)	−.290	−.168	−.258	−.030
	(.225)	(.101)	(.170)	(.077)
Instruments for WOWNHI:				
Husband's health insurance (HHI)	No	Yes	No	Yes
Husband's firm size	Yes	No	Yes	No
Husband's union status	Yes	No	Yes	No

NOTE.—In each model, the wage equation for the wife includes the following variables: a large city indicator, region indicators, three race/ethnicity variables, wife's firm size, wife's union status, a cubic in wife's potential labor market experience, wife's education, number of children under age 18, husband's education, and a cubic in husband's potential labor market experience.

equation indicates whether or not the woman is covered by health insurance through her own employer. These estimates are directly comparable with the estimates reported in columns 6 and 9 of table 4. When husband's firm size and union status are used as instruments for WOWNHI, the coefficient on WOWNHI is −.290 in the April sample; this compares with an estimate of −.231 from the March 1990–93 sample. These point estimates are very similar, though the standard error is substantially larger in the April subsample because of the substantially smaller sample size. The p-value on the hypothesis that the instruments are orthogonal to the error term in the wage equation is .176 in the April 1993 sample. This compares with a p-value of .256 in the 1990–93 sample. When husband's health insurance coverage is used as an instrument, the coefficient on WOWNHI is −.168. This compares with −.101 in the March subsample. Again, however, the standard error is substantially larger in the April subsample. The null hypothesis that β_1 is zero cannot be rejected at conventional significance levels in these two models. Thus, while the point estimates from the April sample are similar to and not statistically different from the estimates using the March 1990–93 sample, the estimates from the April sample are also not different from zero.

The last two columns of table 6 show estimates of the trade-off between accepting health insurance and declining health insurance among only those wives eligible for health insurance. The sample for this analysis excludes wives working for employers who do not offer health insurance to any workers or wives who work full-time but are not eligible for health insurance benefits that are offered to other employees. Therefore, in this specification, the coefficient on WOWNHI is an estimate of the wage trade-off between accepting versus not accepting health benefits conditional on being eligible for the benefits. For this subsample, the coefficient on WOWNHI is −.258 when husband's firm size and union status are used as instruments. This estimate is very similar to the estimate in column 1 of table 6 using the full sample. Again, however, the estimated standard error is quite large. When husband's coverage is used as an instrument, the coefficient on WOWNHI is −.030.[2]

The similarity between the estimates in columns 1 and 3 of table 6 and the close corresponds between these two point estimates and the estimate of −.231 using the March 1990–93 sample (see col. 9 of table 4) suggest that the IV estimate of the trade-off between wages and health insurance in the March 1990–93 sample is generated by a comparison between those women who accept coverage and those women who decline coverage rather than a comparison between women who accept coverage and women who are uncovered because their employer does not offer benefits or because they are ineligible for the benefits provided to other employees.

Additional, indirect evidence that the comparison in coverage among those women eligible for coverage is generating the earlier results is provided by the estimated relationship in the April 1993 sample between the two instruments—husband's firm size and union status—and the probability that wives are offered health insurance through their employers. Conditional on the other variables in the wage model, there is no statistically significant relationship between these two instruments and the probability of being offered health insurance benefits. Thus, these two variables are very weak instruments for health insurance eligibility. On the other hand, there is a very strong relationship between the two instruments and accepting coverage conditional on being eligible for health benefits. Although the estimates are imprecise, the April 1993 data suggest that women who either are married to men employed in unionized positions or are working for large employers are more likely to decline coverage and earn a higher wage as compared with women married to men working in small firms or in nonunion jobs. The latter group of women are more likely to accept the health insurance coverage available to them and receive a lower wage.

If the estimates of the trade-off between wages and health insurance reported in table 4 are generated by the choices made by women who are eligible for own employer health insurance coverage, it is useful to

[2] Models were also estimated comparing wives who had their own employer health insurance with wives who were not offered health insurance through their employer. This excludes from the analysis wives who were offered and declined coverage. The IV estimate using husband's firm size and union status as instruments was implausibly large (−2.533) with a very large standard error (3.607).

speculate on the behavioral processes that could generate a trade-off between wages and the health insurance take-up rate. Without a plausible behavioral explanation for the result, a reader may be inclined to conclude that the estimates from the March 1990–93 sample reflect assortive mating rather than an estimate of the market value of health insurance coverage. One possibility is that firms offering health insurance offer different wages to workers based on whether they accept or decline health insurance coverage in an effort to equalize total compensation between equally productive workers. Investigating this explanation would require matched data on workers and firms. A second, and perhaps more plausible process, is based on the significant variation across employers in the quality of the health benefits provided and the "out-of-pocket" expenses workers are required to pay to cover part of the total insurance premium or the cost of specific health care treatments. If individuals who work for firms that offer less generous benefits are more likely to decline coverage because of spousal coverage, then firms offering these less generous health benefits may pay higher wages as compared with firms with a higher health insurance take-up rates that is generated by better and more costly health benefits. Unfortunately, the CPS surveys lack the detailed information on the generosity of health benefits and cost-sharing arrangements between workers and firms that is necessary to investigate this possibility.

VI. Comparing the IV Estimates with Other Estimates of Health Care Costs

Another method for judging which of the estimates reported in table 4 are plausible estimates of the trade-off between wages and health insurance is to compare these estimates with other independent estimates of the value of health care provided by employer-provided health insurance. In the simple model describing the trade-off between wages and health insurance shown in figure 1, the wage reduction workers give up to receive health benefits should approximately equal the expected value of health care received by those covered by the benefits. A number of factors could modify the prediction of a dollar-for-dollar trade-off between wages and health care, including risk aversion, tax considerations, and the possibility of productivity effects (negative or positive) associated with providing health benefits. However, the dollar-for-dollar trade-off between wages and the cost of health insurance benefits remains a useful benchmark for evaluating the different estimates reported in table 4.

Table 7 translates the different estimates in table 4 into the yearly annual cost of health benefits as measured by the estimated wages forgone to obtain health benefits. For each model, the predicted hourly wage was obtained for an "average" woman in the sample, who was assumed to be employed on a job without health insurance. The hourly wage for this

Table 7
Estimated Wage Trade-Off to Obtain Health Insurance Implied by the Different Estimates in Table 4 for an "Average" Married Woman Employed Full-Time

Table 4 Specification	Estimated Annual Cost ($) of Health Insurance	SE
(2)	3,404	(946)
(3)	9,416	(1,618)
(4)	1,192	(1,586)
(5)	6,517	(1,265)
(6)	2,093	(782)
(7)	6,148	(1,452)
(8)	3,493	(1,704)
(9)	5,213	(1,217)

NOTE.—These estimates assume a 2,000-hour work year and an average hourly wage equal to the mean predicted wage from the wage regression after setting WOWNHI to zero, and all of the other variables are equal to their sample means.

average worker was then multiplied by the estimates reported in table 4 to obtain an estimate of the average hourly wage that would have to be given up to obtain health insurance. This value was then multiplied by 2,000 hours to obtain the annual cost. For example, specification 6 using HHI as an instrument gives a lower-bound estimate of β_1 that translates into an estimate of the yearly cost of health benefits that is equal to $2,093. This compares with an estimate of $5,213 when both union status and firm size are the instruments (specification 9). The estimate using only union status as an instrument (specification 8) generates an estimate for the value of health insurance equal to $3,493 per year.

How do the estimates in table 7 compare with other evidence on the value of employer provided health insurance? The best currently available public data on health costs covered by insurance that roughly matches the time period corresponding to this study comes from the 1987 National Medical Expenditure Survey. In 1997, the Agency for Health Care Policy and Research (Agency for Health Care Policy and Research 1997) "aged" these 1987 data to reflect demographic shifts and changes in per capita health expenditures that have occurred between 1987 and 1995. Using these revised data, Olson and Whittaker (1998) estimated that the average yearly value of health care paid for by private insurance was $1,195 for adult males, $1,856 for adult females, and $819 for children. Thus, for a family of four, the total annual expected health care expenditures from these "aged" data is $4,489. This value falls between the preferred estimates from specifications 8 and 9 and is within a standard error of both estimates.

The estimates in table 7 can also be compared with the average responses obtained from a 1991 Gallup survey of 1,000 randomly selected U.S. adults. Workers in this survey covered by employer-provided health insurance were asked, "How much more money would [your employer] have to give you each year to make you willing to give up your employer-provided health benefits?" Olson (1994) reports that the median response to this question was $3,600 and the mean response was $4,240 per year. Again, the similarity between the mean response to this hypothetical question and the preferred estimate reported in table 4 lends credibility to the preferred estimates from this analysis.[3]

VII. Summary and Conclusions

Previous empirical research has failed to find the negative trade-off between wages and health insurance that is predicted by compensating wage theory. Although data consistent with the theory have been identified in other settings using pensions or compensation for risky jobs (Rosen 1986), the absence of strong evidence in the area of employer-provided health insurance is especially troublesome because of the importance of health insurance in total compensation and the central role employer-provided health benefits play in the distribution of health care in the United States. It is very difficult to discuss or evaluate how the labor market affects the distribution of health benefits without having empirical evidence on who pays for employer-provided health insurance. If a reader relied solely on the results from previous empirical research, she would have to conclude that firms and employees do not face a trade-off between wages and health benefits when deciding how to allocate a dollar of compensation.

In contrast with previous research, this study finds a statistically and economically meaningful trade-off between wages and health insurance for women working full-time that is consistent with compensating wage theory. The preferred estimates use husband's union status and husband's firm size as instruments for whether a wife working full-time has health insurance through her job. The estimates suggest that the average woman in our sample had to accept about a 20% wage reduction to move from a job that does not provide health insurance to a job that provides health benefits. This translates into an implicit value of health benefits that corresponds to about $4,000 per year (early 1990$). This estimate is very close to independent estimates of the cost of health care received by families with private health insurance coverage, and it is also close to what

[3] Theoretically, the Gallup poll values should be larger than the market price of health insurance because only workers with health insurance were asked the hypothetical question by Gallup (Olson 1994). Since workers with health insurance place a higher value on health benefits as compared with workers without health insurance, the amount these workers would need in additional salary to voluntarily give up their health insurance is greater than the market value of health insurance that depends on the preferences of both those with and without health insurance.

workers say they would need in a wage increase to voluntarily move from a job that provides health benefits to a job that lacks health benefits.

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