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# A COMPARISON OF PARAMETRIC AND SEMIPARAMETRIC ESTIMATES OF THE EFFECT OF SPOUSAL HEALTH INSURANCE COVERAGE ON WEEKLY HOURS WORKED BY WIVES

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## SUMMARY

Health insurance in the USA for most of the non-aged population is provided as a fringe benefit that is received by an adult family member as part of his or her compensation package. In husband and wife households health insurance is more likely to be part of the husband's compensation package than the wife's compensation package. However, when a husband does not have employer-provided health insurance, his wife may seek health insurance through an employer. Because health insurance through one's employer typically requires that a worker is a full-time employee, spousal health insurance coverage for wives is predicted to influence their labour supply decisions. Parametric and semiparametric statistical models using March 1993 CPS data show wives without spousal health benefits are more likely to work full-time than those who do have spousal health benefits. © 1998 John Wiley & Sons, Ltd.

## 1. INTRODUCTION

Employer-provided health insurance is the dominant mechanism by which individuals in the USA under the age of 65 gain access to health care and insure their families and themselves against the financial burden caused by the costs of treating chronic and acute health conditions. The most recent published data from the Current Population Survey show that in 1995 84·6% of the US population was covered by public or private health insurance and employer-provided health insurance was the dominant form of coverage. In that year 70·3% of the population was covered by private health insurance and 87% of those individuals (61·1% of the total population) gained health insurance benefits through a family member that received these benefits from a current or former employer (US Bureau of the Census, 1996).

Relatively few part-time jobs provide health insurance benefits. In 1992 23% of employees working 34 hours per week or less received health insurance through their employer, whereas 70% of full-time (more than 34 hours/week) employees had employer provided health insurance. I hypothesize that wives who do not have health insurance coverage through their husband's employer are more likely to work full-time in order to obtain health insurance for themselves and for other family members than are wives who have health insurance through their husband's employer. Support for this proposition is found using both parametric and semiparametric estimation methods. Using CPS data from March 1993, I find women without spousal coverage were less likely to be out of the labour force than women with spousal coverage. Among working

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wives, those without spousal coverage were more likely to work full-time than wives with health benefits through their husband's employer.

The paper is divided into eleven sections. The next section briefly describes the theoretical and empirical relationship between health insurance benefits and labour supply. Section 3 describes the data used to estimate the relationship between a husband's health insurance benefits and his wife's labour supply decisions. Section 4 describes and presents the results for four different parametric models of wives' labour supply decisions. Section 5 describes the semiparametric method of DiNardo, Fortin, and Lemieux (1996) and its application to the labour supply decision. The semiparametric estimates are presented in Section 6 and these estimates are compared to the parametric predictions in Section 7. Semiparametric estimates from an alternative counterfactual distribution are described and presented in Section 8. Section 9 compares the distribution of hours for working wives with and without spousal coverage after accounting for whether the wives without spousal coverage have health insurance through their own employer. Section 10 discusses the potential biases introduced by the endogeneity of husband's health insurance status and presents results using an alternative measure of spousal coverage. The paper concludes with a brief summary.

## 2. THE RELATIONSHIP BETWEEN HEALTH INSURANCE BENEFITS AND FULL-TIME EMPLOYMENT

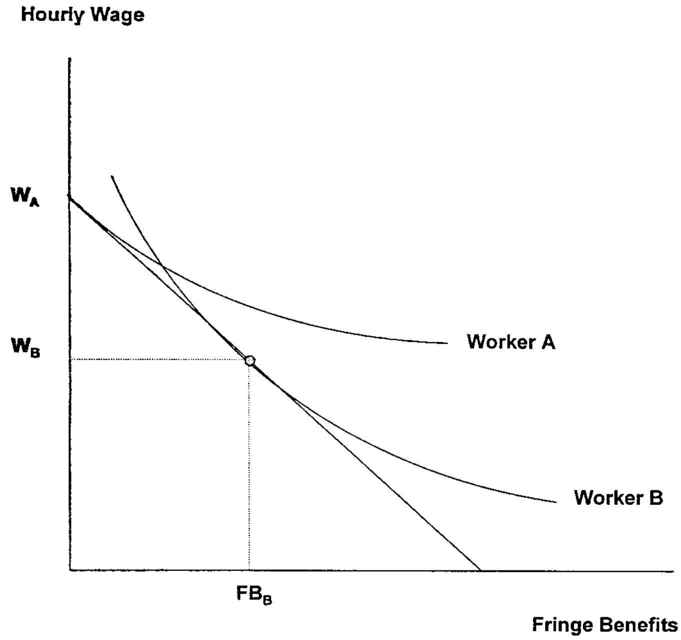
Standard compensating wage theory applied to fringe benefits predicts that workers differ in their demand for employer-provided benefits and sort themselves across firms so that the mix of wages and fringe benefits match their preferences. Holding human capital and other variables influencing wages constant, workers that receive more generous fringe benefits are paid a lower wage than comparable workers who prefer fewer fringe benefits (Rosen, 1986). The standard figure illustrating this prediction is shown in Figure 1 where workers maximize their utility subject to a budget constraint defined by their human capital and ability levels. Worker A prefers a compensation package without any fringe benefits and a wage of $W_A$ while Worker B accepts a job that provides a wage of $W_B$ and fringe benefits costing $FB_B$.

This simple model of fringe benefits does not account for the private information prospective employees have about their demand for health care. Individuals may have information about their own health or the health needs of other family members that is unobserved by the firm but affects their demand for employer-provided health insurance. This information asymmetry between the firm and the worker creates an adverse selection problem for the firm when it sets the wage and health insurance package it offers to employees. In the absence of adverse selection, Figure 1 shows employees bear the cost of expected health benefits through the downward adjustment in the wage rate from $W_A$ to $W_B$; the expected hourly cost of health insurance for full-time workers is $(W_A - W_B)$. Firms will be reluctant to hire a worker at the $(W_B, FB_B)$ compensation package if they believe that the individual's expected health care needs exceed $FB_B$. However, because individuals have better information about their expected health care needs than the firm, a firm offering the $(W_B, FB_B)$ combination will be especially attractive to workers who expect their health care expenditures to exceed $FB_B$.

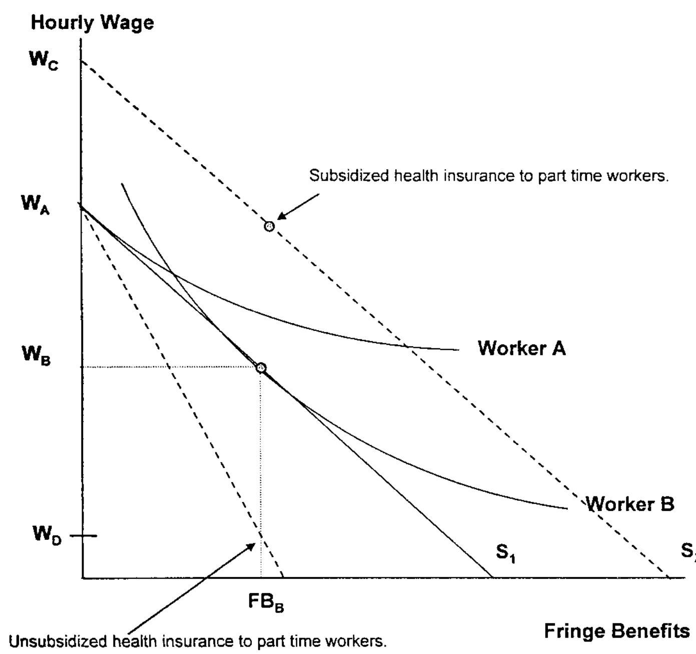
There are a variety of strategies firms may pursue to try to manage the adverse selection problem created by the private information workers have about their health needs.[1] One strategy

[1] For example, during the time period covered by this study, firms could minimize adverse selection by limiting benefits for the treatment of pre-existing health conditions.




(a)




(b)

Figure 1. Wage–fringe benefits trade-offs

firms can use to reduce adverse selection is to limit health insurance coverage to full-time workers. There are a number of reasons a firm would choose this policy. First, a full-time work requirement may screen out workers with costly health care problems because these same health problems may preclude full-time employment.

Second, firms providing health benefits to part-time workers will attract a part-time workforce with a higher unobserved demand for health benefits relative to either their full-time workforce or the part-time workers in firms which do not provide health insurance. This occurs because health insurance is a larger share of total compensation for part-time workers than for full-time workers. This effect is illustrated in Figure 1(b). If $S_1$ is the budget constraint describing the trade-off between wages and health insurance for full-time workers and part-time employees work half the hours of full-time workers, then the hourly wage cost of health insurance for these workers is $2^*(W_B - W_A)$ or $(W_A - W_D)$. The higher hourly price that part-time workers pay for health insurance compared to the price paid by full-time workers will increase the relative attractiveness of the job to part-time workers with even higher unobserved demand for health care. Thus, extending health care to part-time workers would further exacerbate the adverse selection problem.

To avoid increasing the extent of adverse selection among part-time workers, firms offering health insurance to part-time workers might decide to subsidize the cost of health insurance to part-time workers by paying these workers an hourly wage of $W_B$ instead of $W_D$. This, however, is equivalent to shifting the budget constraint from $S_1$ to $S_2$ and raising total hourly compensation to $W_C$ per hour. In competitive markets this is not a viable strategy for the firm because the hourly compensation rate is now higher than the wage ($W_A$) paid by competitors who decide not to provide health benefits to part-time workers. This discussion suggests firms will choose not to offer health insurance to part-time workers to avoid the higher adverse selection or higher labour costs such a benefit will likely entail.

The empirical relationship between hours worked and employer-provided health insurance is shown in Figure 2. The data shown in this figure are from the March 1993 CPS and is for the sample of all employees, regardless of gender and marital status. The data points show the fraction of workers with health benefits through their own employer at each value for usual weekly hours. The sizes of the data points are proportional to the sample weighted number of individuals at each point. The line in the graph is the weighted estimated spline function with kink points at 19, 34 and 40 hours per week and the values above each line segment show the estimated slope and standard error for the line segment. The numbers in square brackets below the estimated relationship are the coverage levels at each of the kink points.

Figure 2 shows that the positive relationship between hours worked per week and health insurance coverage is largely due to the sharp increase in coverage at 35 hours per week. Over the [1, 19] range there is no relationship between hours and the probability of having health benefits. Over the [19, 34] hour interval the probability of having health benefits increases by 1·6 percentage points per hour. From 34 to 40 hours the probability of having health benefits increases by over 5 percentage points for each additional hour worked. Finally, above 40 hours per week there is no relationship between hours worked and the probability workers have health insurance. These data are generally consistent with the theoretical prediction from compensating wage theory and they suggest workers searching for a job with health benefits will have their greatest chances of success by searching for a full-time position. It is this relationship between full-time employment and health insurance coverage that leads to the prediction that wives who do not have health benefits through their husband's employer are more likely to work full-time in order to obtain these benefits.

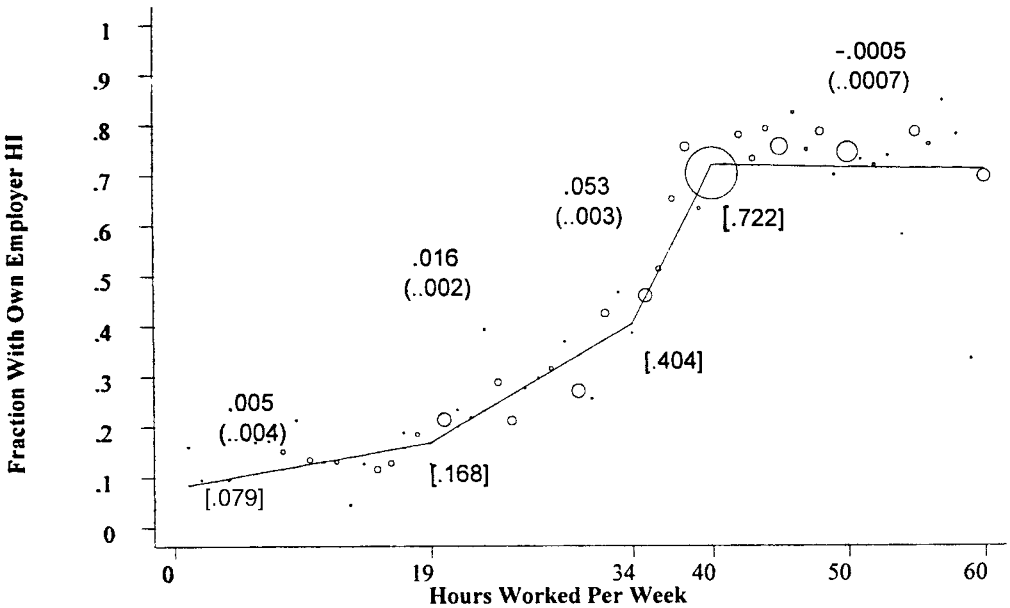



Figure 2. Share of workers with own employer *HI* by hours worked, 1992

## 3. THE DATA

This section describes the sample of married couples that are used to investigate the impact of husbands' health insurance coverage on the labour supply decisions of wives. Each year since 1980 the March Supplement to the CPS has included a set of questions on health insurance. While there have been some changes in these questions over the years, these surveys provide reasonable data on the changing distribution of health insurance coverage in the USA. The data used in this study are from the March 1993 survey where the health insurance questions refer to benefits provided by the longest job held during 1992. Similarly, the labour supply measure is usual hours worked on the longest job held in 1992.

The following steps were followed to create the sample used in the study. First, husbands and wives from single-family households were extracted to separate files. Records in these files were then matched on the household ID code to create a single record for each married couple included in the survey. Next, all couples were eliminated where the wife was over the age of 64 or her labour force status in March 1993 at the time of the interview was different from her status in 1992. Finally, households were elminiated where respondents were assigned allocated values for the relevant health insurance questions or for the husband's total earnings in 1992. Couples were also dropped from the sample if the wife's labour force status changed from 1992 to the time of the interview in March 1993. This produced a sample of 22,272 families. In 15,620 families the wife's usual hours worked per week in 1992 were greater than zero.

An important distinction among husbands with health benefits through their own employer is whether their wives were also covered by this policy. Among married couples where the wife worked in 1992, 37·9% of the wives were married to husbands who did not have health benefits from their employer. Among those working wives married to husbands who did have health benefits, 23·8% were not covered by their husband's health insurance policy. Thus, 52·7% of all working wives were not covered by their husband's policy either because their husbands lacked health benefits or because they were not covered by their husband's health benefits. Among wives not in the labour force, 7% were married to husbands who do not receive any health benefits and 7% are married to husbands with health insurance that did not cover them. In this study I assume wives without spousal coverage either because their husbands lacked health benefits or because they were not covered by their husbands' benefits are equally likely to demand a job with health benefits. Thus, the relevant variable affecting a wife's labour supply decision is whether she is covered by the health benefits her husband receives through his employer.[2]

## 4. ALTERNATIVE PARAMETRIC ESTIMATES OF THE EFFECT OF SPOUSAL COVERAGE ON HOURS WORKED

The limited supply of part-time jobs offering health insurance implies that wives seeking jobs with health insurance because they lack spousal coverage will be more likely to seek full-time employment to obtain these benefits. Table I provides simple descriptive statistics consistent with this hypothesis. The table shows summary measures of hours worked per week by employed wives as a function of their coverage through their husbands' employer. While there is no difference in median hours worked by spousal coverage, wives who are not covered by their husbands' insurance worked an average of 3·7 hours per week more and were 15 percentage points more likely to be working 35 or more hours per week relative to wives with spousal coverage. In addition, the data show a significant difference in the labour force participation rates of wives based on spousal coverage. Wives without spousal coverage were significantly more likely to be working than wives with spousal coverage. The labour force participation rate for wives without spousal coverage was 74·1% and the rate for wives with spousal coverage was 66·1%. The percentage of wives with spousal coverage who worked 35 or more hours per week was 44·2% and 60·9% of the wives without spousal coverage worked at least 35 hours per week.

While the preceding descriptive statistics suggest spousal coverage affects the labour supply decisions of wives, the simple bivariate relationship between wives' labour supply and spousal coverage could be due to other variables correlated with spousal coverage for wives and the labour supply decisions of wives. Four slightly different parametric statistical models were used

Table I. Hours worked per week by working wives based on their coverage under husbands' health benefits, 1992

| | Mean hours | Median hours | Fraction with hours = 35 |
|---|---|---|---|
| All working wives | 36·6 | 40 | 0·749 |
| Working wives covered by husbands' health benefits | 34·7 | 40 | 0·668 |
| Working wives not covered by husbands' health benefits | 38·4 | 40 | 0·822 |

$N = 15{,}620$.
Author's tabulations from extract created from the March 1993 CPS. These are sample weighted estimates using the household sampling weights.

[2] The potential bias this may introduce in the estimates is discussed in Section 10.

to estimate the following labour supply equation and control for these potentially confounding variables:

$$\text{Labour supply} = Z\beta + \alpha(HHI) + \varepsilon \tag{1}$$

*HHI* is a dummy variable equal to '1' if the wife in the family is covered by health insurance provided through her husband's job.[3] The $Z$ matrix includes the following covariates: five education dummies, three race/ethnicity dummies, potential labour market experience (e.g. age-years of eduction–5), potential labour market experience, potential labour market experience, the presence and age of children in the household and husband's income. The labour supply measure was one of four measures: (a) usual hours worked per week, (b) a labour force participation indicator variable measuring whether usual hours worked was greater than zero, (c) a categorical variable denoting if hours of work per week were zero, greater than zero but less than 35 or greater than or equal to 35 hours per week, or (d) a categorical variable indicating if hours were greater than zero, greater than zero but less than 35, greater than or equal 35 hours and less than or equal to 40 hours or greater than 40 hours. This last measure of labour supply was motivated by Figure 2 which shows the probability of having a job with health insurance does not increase with hours after 40 hours per week. This figure suggests most of the effects of spousal coverage on labour supply are likely to occur between the [0, 34]- and [35, 40]-hour intervals. A Tobit model was estimated using labour supply measure (a). Labour supply measure (b) was estimated using a binary probit model and labour supply measures (c) and (d) were estimated as ordered probit models.

The estimates for the four parametric models are shown in Table II. The parameter estimates for the covariates are in the expected direction. Wives with children work fewer hours per week and children under the age of six have a larger predicted effect on hours than the number of children over the age of six. Wives with a college education work more hours per week than less educated wives. The negative coefficient on husband's earned income is consistent with a positive income effect on a wife's demand for leisure. The coefficients on *HHI* in the various statistical models are all statistically significant and in the predicted direction. Wives without spousal coverage were more likely to work longer hours than wives without spousal coverage. Discussion of the implied effect of the coefficients on *HHI* from these models for different measures of labour supply are presented and discussed later when these parametric estimates are compared to results from the semiparametric method.

There are several other alternative explanations for the results reported in Table II. First, husbands' health insurance coverage may simply index 'better' jobs. This alternative explanation implies a correlation between 'good' and 'bad' jobs and husbands' health insurance coverage *after* conditioning on husband's income. To further investigate this alternative, a model was estimated that included the demographic characteristics of the husband (education, race, potential experience) in the wife's labour supply equation. While some of these variables were statistically significant, including these variables did not significantly change the coefficients on *HHI* in any of the models.[4]

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[3] Whether or not the wife has health insurance on her job is not included in the labour supply equation because health insurance coverage and hours worked are assumed to be jointly chosen by the wife given the employer constraint that full-time work is required to receive health benefits. This labour supply equation is most appropriately thought of as a 'reduced-form' equation where husband's health insurance coverage influences both a wife's health insurance coverage through her job and her labour supply decision.

[4] These results are available from the author upon request.

Table II. Probit and Tobit model estimates of the usual hours worked per week, married women, 1992

| | Probit LFP | Ordered probit NLF/PT/FT | Ordered probit NLF/PT/35–40/ > 40 | Tobit model |
|---|---|---|---|---|
| Constant | 0·749 | −0·654 | −0·439 | 20·543 |
| | (0·088) | (0·076) | (0·070) | (1·472) |
| *HHI* | −0·283 | −0·373 | −0·336 | −6·67 |
| | (0·021) | (0·018) | (0·016) | (0·345) |
| 9–11 years of education | 0·093 | 0·105 | 0·132 | 3·397 |
| | (0·055) | (0·052) | (0·050) | (1·071) |
| 12 years of education | 0·529 | 0·504 | 0·491 | 12·102 |
| | (0·049) | (0·046) | (0·045) | (0·949) |
| 13–15 years of education | 0·682 | 0·602 | 0·585 | 14·18 |
| | (0·051) | (0·048) | (0·046) | (0·982) |
| 16 years of education | 0·774 | 0·727 | 0·792 | 16·47 |
| | (0·055) | (0·050) | (0·048) | (1·024) |
| > 16 years of education | 1·026 | 0·95 | 1·055 | 20·875 |
| | (0·066) | (0·058) | (0·053) | (1·124) |
| Black | 0·22 | 0·306 | 0·181 | 4·412 |
| | (0·040) | (0·035) | (0·030) | (0·634) |
| Neither black nor white | −0·152 | −0·057 | −0·019 | −1·629 |
| | (0·132) | (0·121) | (0·110) | (2·340) |
| Hispanic | −0·227 | −0·166 | −0·159 | −3·776 |
| | (0·045) | (0·041) | (0·038) | (0·813) |
| Potential LF exp. | 0·044 | 0·055 | 0·057 | 0·796 |
| | (0·010 | (0·009) | (0·008) | (0·166) |
| Potential LF exp.$^2$/100 | −0·2 | −0·226 | −0·21 | −2·41 |
| | (0·046) | (0·039) | (0·035) | (0·751) |
| Potential LF exp.$^3$/1000 | 0·007 | 0·01 | 0·007 | −0·167 |
| | (0·006) | (0·005) | (0·005) | (0·100) |
| No. of children < 6 years old | −0·566 | −0·535 | −0·471 | −10·541 |
| | (0·017) | (0·015) | (0·014) | (0·291) |
| No. of children 6–18 years old | −0·165 | −0·201 | −0·19 | −3·822 |
| | (0·011) | (0·010) | (0·009) | (0·191) |
| Husband's earned income | −0·027 | −0·022 | −0·015 | −0·484 |
| ($10,000) | (0·005) | (0·004) | (0·004) | (0·077) |
| North Central Region | 0·055 | 0·053 | 0·098 | 1·627 |
| | (0·029) | (0·025) | (0·022) | (0·477) |
| South Region | −0·12 | −0·004 | 0·043 | −0·097 |
| | (0·027) | (0·023) | (0·021) | (0·448) |
| West Region | −0·114 | −0·072 | −0·016 | −0·77 |
| | (0·030) | (0·026) | (0·024) | (0·504) |
| Cut Point, ge 35 hours | | −0·111 | 0·1 | |
| | | (0·076) | (0·069) | |
| Cut Point, gt 40 hours | | | 1·587 | |
| | | | (0·070) | |
| $\sigma_\varepsilon^{\cdot 5}$ | | | | 22·615 |
| | | | | (0·139) |

Standard errors are in parentheses.

A second alternative explanation is that the effect of husbands' health insurance coverage on the labour supply of wives simply reflects the income effect of these health benefits. This is not a plausible explantation because the magnitudes of the coefficients on *HHI* are simply too large relative to the size of the coefficient on husbands' earned income. For example, in the Tobit model, a \$10,000 decline in husband's income produces a predicted 0·42 hour decline in the work week. This compares to the predicted effect of losing health insurance of 6·06 hours.[5] If the effect of husbands' health coverage was due only to the income effect of the benefit, the estimated effect of *HHI* implied by the Tobit model corresponds to an income effect on labour supply worth far more than the cost of health insurance. Thus, the estimated effect of *HHI* is not due to pure income effects.

## 5. A SEMIPARAMETRIC STATISTICAL MODEL OF HOURS WORKED BY WIVES

Though the estimates in Table II are in the predicted direction, they may be biased because the model assumes that the error term is normally distributed with a constant variance. It is well known that violations of these assumptions produce biased parameter estimates (Goldberger, 1983). There is evidence that these assumptions will not hold in this context. Therefore, the semiparametric method developed by DiNardo, Fortin, and Lemieux (1996) is used to re-estimate the impact of spousal coverage on labour supply and to provide a comparison to the different parametric models. The use of DiNardo *et al.* was motivated by Figure 3. This figure shows the sample weighted hours distribution for wives with and without coverage through their spouse. These distributions show the expected and substantial mass points at 0 and 40 hours per week for both groups of workers and much smaller peaks at 5- and 10-hour intervals. Thirty-four per cent of the sample with spousal coverage worked zero hours while 26% without spousal

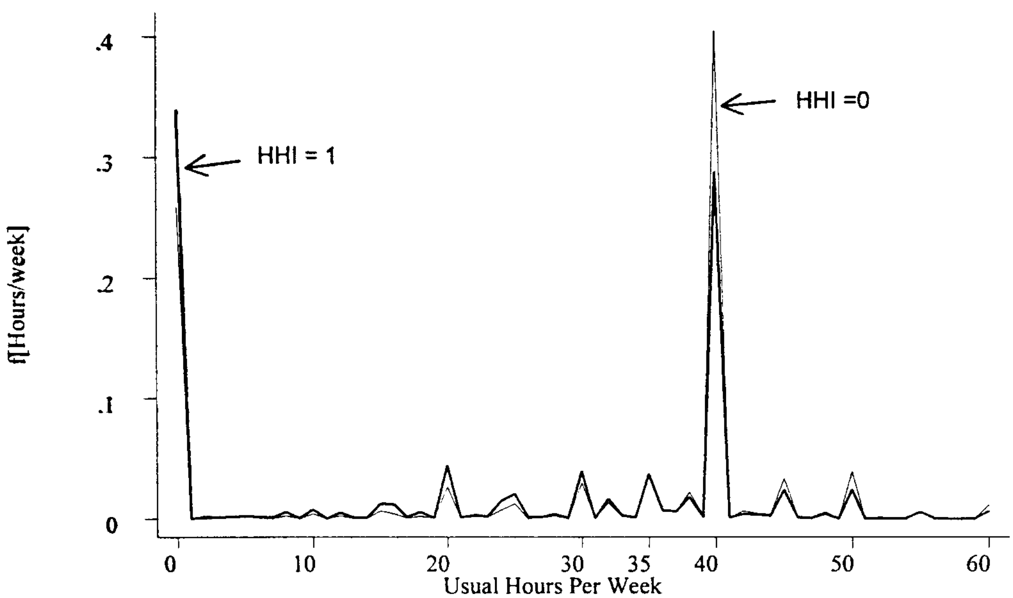



Figure 3. Density of hours/week for wives by husbands' *HI*

[5] These values were calculated for a white, high school-educated wife with average potential labour market experience, one child 6–18 years old, a husband with earnings equal to the sample mean and *HHI* equal to one. The values reported are the changes in expected hours per week given a \$10,000 decline in the husband's income or the loss of spousal health insurance coverage.

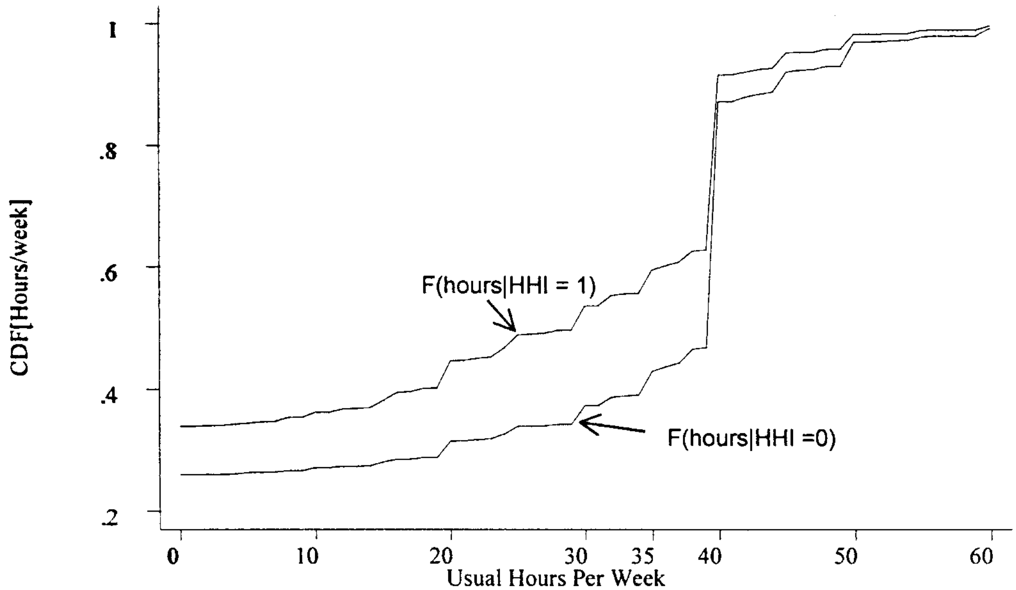



Figure 4. CDF of hours/week for wives by husbands' *HI*

coverage were out of the labour force. On the other hand, 44% without spousal coverage worked exactly 40 hours per week and 32·1% of wives with spousal converge work 40 hours per week. Figure 3 also shows slightly more probability mass in the 10–34-hour interval for wives with spousal coverage.

A clearer illustration of the differences in the two distributions is shown in Figure 4 and Table III. Figure 4 plots the estimated cumulative distribution functions for wives based on spousal coverage and Table III shows selected points along these distributions. As noted earlier,

Table III. Selected points along *F*(hours) for working wives with and without spousal coverage, 1992

| | *F*(hours) | |
|---|---|---|
| Hours | No spousal coverage | Spousal coverage |
| 0 | 0·259 | 0·339 |
| 10 | 0·270 | 0·362 |
| 15 | 0·280 | 0·382 |
| 20 | 0·314 | 0·446 |
| 25 | 0·339 | 0·488 |
| 30 | 0·373 | 0·536 |
| 34 | 0·391 | 0·558 |
| 35 | 0·429 | 0·596 |
| 40 | 0·873 | 0·917 |
| 45 | 0·923 | 0·954 |

$N = 22{,}272$.
Author's tabulations from extract created from the March 1993 CPS. These are sample weighted estimates using the household sampling weights.

the difference in labour force participation rates is 0·08. At 15 hours the difference in the CDFs is 0·102. Thus, 78% of the difference in the CDFs at 15 hours is generated by differences in labour force participation rates. Between 15 and 34 hours the CDFs diverge, reflecting relatively more part-time employment among wives with spousal benefits. While 11·1% of wives without spousal coverage work 16–34 hours, 17·6% of wives with spousal coverage work 16–34 hours. The difference between the CDFs reaches a maximum of 0·167 at 34 hours and the two distributions nearly coverage at 40 hours where the difference is only 0·0404. While Figure 4 is consistent with the hypothesized effect of *HHI* on hours worked, the differences may also reflect other differences in the characteristics of wives that are correlated with spousal coverage.

The method developed by DiNardo *et al.* (1996) adjust these unconditional hours distributions for differences in the observable variables affecting hours worked. The hours distributions for wives with and without spousal coverage can be expressed as:

$$\begin{aligned} f(\text{hours} \mid HHI = 1) &= f(\text{hours} \mid I_{\text{HOURS}} = 1, I_Z = 1) \\ &= \int f(\text{hours} \mid I_{\text{HOURS}} = 1, Z, I_{HHI} = 1)\, \mathrm{d}F(Z \mid I_Z = 1) \end{aligned} \tag{2}$$

$$\begin{aligned} f(\text{hours} \mid HHI = 0) &= f(\text{hours} \mid I_{\text{HOURS}} = 0, I_Z = 0) \\ &= \int f(\text{hours} \mid I_{\text{HOURS}} = 0, Z, I_{HHI} = 0)\, \mathrm{d}F(Z \mid I_Z = 0) \end{aligned} \tag{3}$$

In these equations $I_j = 1$ if the distribution of the *j*th variable(s) comes from the sample where wives have coverage through their husband's job ($HHI = 1$) and $I_j = 0$ if the distribution of the *j*th variable comes from the sample where wives do not have coverage through their husband's job. The difference between equations (3) and (2) can be written as

$$\begin{aligned} f(\text{hours} \mid HHI = 1) - f(\text{hours} \mid HHI = 0) &= f(\text{hours} \mid I_{\text{HHI}} = 1, I_Z = 1) \\ &- f(\text{hours} \mid I_{\text{HHI}} = 1, I_Z = 0) \\ &+ [f(\text{hours} \mid I_{\text{HHI}} = 1, I_Z = 0) - f(\text{hours} \mid I_{\text{HHI}} = 0, I_Z = 0)] \end{aligned} \tag{4}$$

The first two terms describe differences in hours for those with spousal coverage assuming these wives had the $Z$ attributes of wives without spousal coverage but the structure of their labour supply decisions remained unchanged. The terms in square brackets describe the difference in hours between those with and without spousal coverage not attributable to the $Z$ attributes. As in a decomposition based on a linear regression model (Oaxaca, 1973), this difference can be attributed to spousal coverage if there are no other omitted variables affecting hours that are correlated with *HHI*.

DiNardo *et al.* show that the counterfactual distribution, $f(\text{hours} \mid I_{\text{HOURS}} = 1, I_Z = 0)$, can be estimated using standard kernel density methods where the data for wives with spousal coverage are reweighed using the following variable:

$$K_z = \{\Pr(HHI = 0 \mid Z)/\Pr(HHI = 1)\}/\{\Pr(HHI = 1 \mid Z)/\Pr(HHI = 0)\}$$

This reweighting term is estimated using the entire sample. $\Pr(HHI = 0 \mid Z)$ and $\Pr(HHI = 1 \mid Z)$ are calculated for each observation based on a probit model of spousal coverage using the same set of exogenous variables used in the Tobit and probit models. $\Pr(HHI = 1)$ and $\Pr(HHI = 0)$ are the unconditional probabilities that wives in the sample do or do not have spousal coverage.

The kernel density estimate of the counterfactual distribution is then obtained by estimating the following equation over the sub-sample of wives with spousal coverage:

$$f(\text{hours} \mid I_{\text{HHI}} = 1, I_Z = 0)_I = \Sigma[(w_i K_{Z,i}/h) G(\text{hours}_{\text{i}}/h)] \tag{5}$$

$W_i$ is the household sampling weight ($\Sigma w_i = 1$), $K_{Z,i}$ is defined above and $h$ is the estimated bandwidth. The bandwidth was selected using the Sheather and Jones (1991) technique and is the same method used by DiNardo *et al.* (Sheather and Jones, 1991). $G(\cdot)$ is the kernel and is assumed to be Gaussian distributed.

As equation (4) shows, the differences between the estimates of equation (5) and an estimate of $f(\text{hours} \mid I_{\text{HOURS}} = 1, I_Z = 1)$ shows how $f$(hours) for wives with spousal coverage would change if these wives had the $Z$ attributes of wives without spousal coverage but the structure of their labour supply decisions given these $Z$s was unchanged. The differences between the estimate of equation (5) and an estimate of $f(\text{hours} \mid I_{\text{HOURS}} = 0, I_Z = 0)$ are the differences in hours worked between those with and without spousal coverage that are not captured by the $Z$ variables. I attributed this difference to spousal coverage. The density functions $f(\text{hours} \mid I_{\text{HOURS}} = 1, I_Z = 1)$ and $f(\text{hours} \mid I_{\text{HOURS}} = 0, I_Z = 0)$ were estimated using equation (5) and by setting the reweighing variable, $K_{Z,i}$, equal to one for everybody.

## 6. THE SEMIPARAMETRIC ESTIMATES

Figure 5(a) plots the estimates of $F(\text{hours} \mid I_{HHI} = 0, I_Z = 0)$, $F(\text{hours} \mid I_{HHI} = 1, I_Z = 1)$ and $F(\text{hours} \mid I_{HHI} = 1, I_Z = 0)$. Slightly less than 17% of the difference in the CDFs at 40 hours can be accounted for by differences in the exogenous variables. Figure 5(b) plots $F(\text{hours} \mid I_{HHI} = 1, I_Z = 0) - F(\text{hours} \mid I_{HHI} = 0, I_Z = 0)$. This figure shows that the differences between the CDFs begin with a difference in the labour force participation rates of 0·069 and then increases to 0·1369 at 33 hours per week before narrowing to 0·0366 points at 40 hours. The sharp drop in the difference between the CDFs over the 35–40-hour interval is consistent with a hypothesized threshold for gaining health benefits that corresponds to ‘full-time’ employment.

The results in Figure 5(a) and 5(b) were used to estimate the effect of spousal coverage on the labour supply decisions of wives. The estimated fraction of wives working more than 40 hours per week is 0·127 for $F(\text{hours} \mid I_{HHI} = 0, I_Z = 0)$ and 0·09 for the counterfactual distribution. I assume this difference in the $\Pr(\text{Hours} > 40)$ is not due to differences in spousal coverage but attributable to other unobservables correlated with spousal benefits. This assumption is consistent with Figure 2 which shows the probability of having a job with health insurance does not increase with hours worked beyond 40 hours per week. If this assumption is not valid, the following calculations understate the effect of spousal coverage on labour supply. I also assume spousal coverage accounts for the convergence in the distributions over the 35–40-hour interval because wives without coverage are more likely to work full-time to gain health benefits. These two assumptions imply the change in the differences between the two CDFs from 34 through 40 hours reflects the effect of spousal coverage. This change in the differences between the CDFs is equal to 0·099 (e.g. 0·136–0·037) and is an estimate for the fraction of wives who would move between full-time employment and either part-time employment or leave the labour force as a result of changes in spousal coverage.

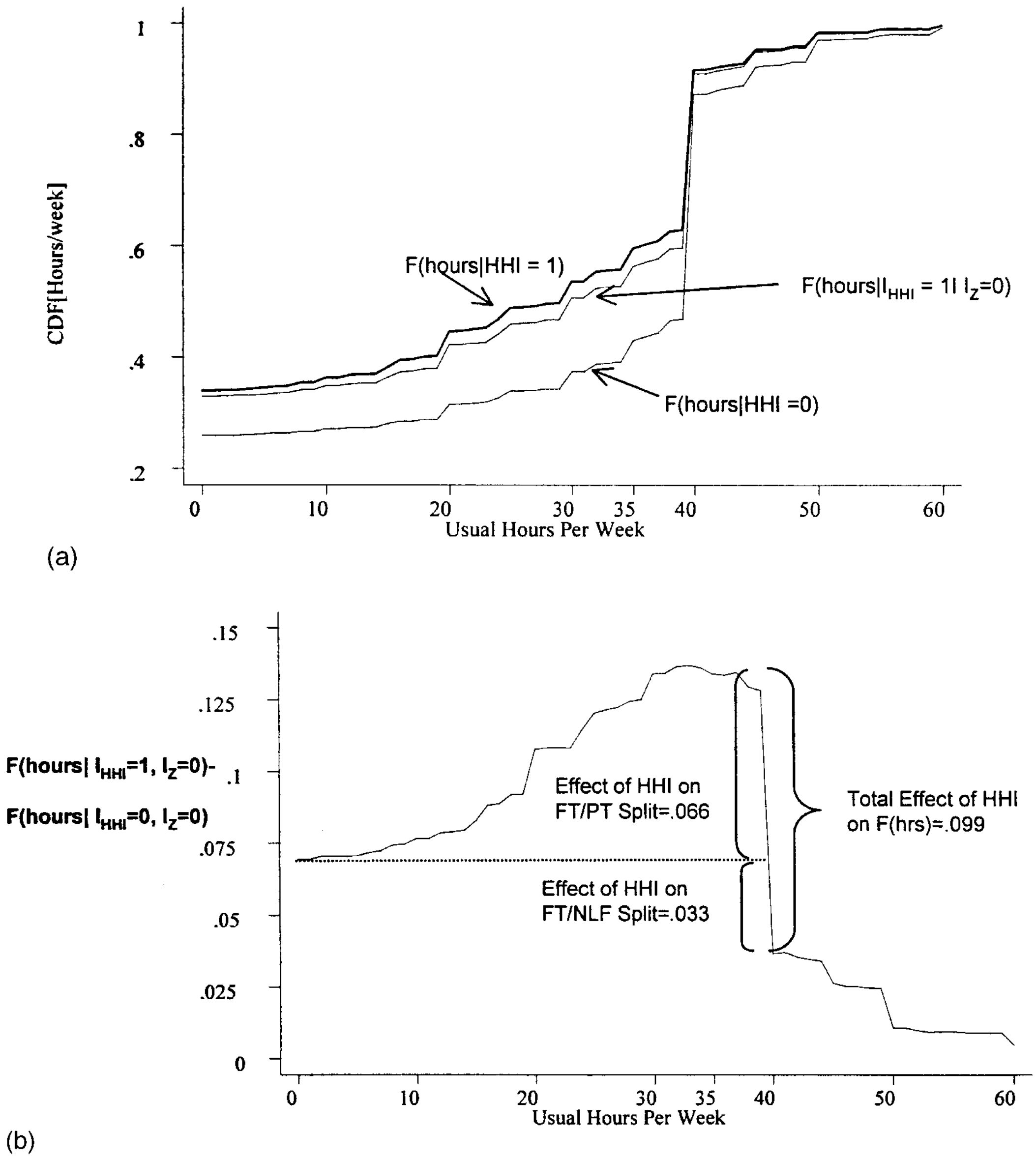



Figure 5. (a) CDF of hours/week for wives by husbands' *HI*. (b) Difference in CDF of hours/week for working wives by husbands' *HI*

The 0·099 change in the differences between the CDFs over the 35–40-hour interval can also be used to estimate the probability that the loss of spousal benefits causes a wife working less than 35 hours per week with spousal benefits to work more than 34 hours per week to gain benefits. The values used for these calculations are shown in column 4 of Table IV. Using the counterfactual distribution among wives with spousal coverage, 52·7% worked less than 35 hours per week. If a random sample of these wives lost their spousal benefits, the estimates imply that 18·8% of these

Table IV. Predicted mean effects of spousal coverage on alternative measures of labour supply and alternative statistical models estimated over the sample of wives without spousal coverage

| | The treatment defined by *HHI*: | | | | Treatment defined by *HHI2*: |
|---|---|---|---|---|---|
| Measure of Labour Supply | Ordered probit NLF/PT/FT | Ordered probit NLF/PT/35–40/ > 40 | Tobit model | Semiparametric model | Semiparametric model |
| (a) $\Pr(\text{Hrs} = 0 \mid I_Z = 0, I_{HHI} = 1)$ | 0·351 | 0·349 | 0·240 | 0·328 | 0·321 |
| (b) $\Pr(\text{Hrs} = 0 \mid I_Z = 0, I_{HHI} = 0)$ | 0·243 | 0·250 | 0·170 | 0·259 | 0·304 |
| (c) Difference | 0·108 | 0·099 | 0·070 | 0·069 | 0·016 |
| (d) $\Pr(0 < \text{Hrs} < 35 \mid I_Z = 0, I_{HHI} = 1)$ | 0·181 | 0·182 | 0·499 | 0·199 | 0·181 |
| (e) $\Pr(0 < \text{Hrs} < 35 \mid I_Z = 0, I_{HHI} = 0)$ | 0·162 | 0·166 | 0·477 | 0·132 | 0·141 |
| (f) Difference | 0·019 | 0·016 | 0·022 | 0·067 | 0·041 |
| (g) $\Pr(\text{Hrs} >= 35 \mid I_Z = 0, I_{HHI} = 1)$ | 0·468 | 0·469 | 0·270 | 0·473 | 0·498 |
| (h) $\Pr(\text{Hrs} >= 35 \mid I_Z = 0, I_{HHI} = 0)$ | 0·594 | 0·584 | 0·343 | 0·609 | 0·555 |
| (i) Difference | −0·126 | −0·115 | −0·073 | −0·136 | −0·057 |
| (j) $\Pr(35 <= \text{Hrs} <= 40 \mid I_Z = 0, I_{HHI} = 1)$ | | 0·388 | 0·070 | 0·383 | 0·406 |
| (k) $\Pr(35 <= \text{Hrs} <= 40 \mid I_Z = 0, I_{HHI} = 0)$ | | 0·448 | 0·060 | 0·482 | 0·443 |
| (l) Difference | | −0·060 | 0·010 | −0·099 | −0·037 |
| (m) $\Pr(\text{Hrs} > 40 \mid I_Z = 0, I_{HHI} = 1)$ | | 0·081 | 0·200 | 0·090 | 0·092 |
| (n) $\Pr(\text{Hrs} > 40 \mid I_Z = 0, I_{HHI} = 0)$ | | 0·136 | −0·283 | 0·127 | −0·112 |
| (o) Difference | | −0·055 | −0·083 | −0·037 | −0·020 |
| (p) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 1)$ | | | 21·94 | 23·92 | 24·60 |
| (q) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 0)$ | | | 27·26 | 28·43 | 26·30 |
| (r) Difference | | | −5·31 | −4·51 | −1·70 |
| (s) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 1, \text{Hrs} > 0)$ | | | 27·39 | 35·61 | 36·21 |
| (t) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 0, \text{Hrs} > 0)$ | | | 31·52 | 38·36 | 37·81 |
| (u) Difference | | | −4·13 | −2·75 | −1·60 |
| (v) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 1, 0 < \text{Hrs} < 35)$ | | | 17·66 | 22·44 | 22·56 |
| (w) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 0, 0 < \text{Hrs} < 35)$ | | | 18·81 | 23·35 | 23·09 |
| (x) Difference | | | −1·15 | −0·90 | −0·53 |
| (y) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 1, \text{Hrs} <= 40)$ | | | 15·41 | 21·27 | 22·58 |
| (z) $E(\text{Hrs} \mid I_Z = 0, I_{HHI} = 0, \text{Hrs} <= 40)$ | | | 17·96 | 25·29 | 23·29 |
| (aa) Difference | | | −2·55 | −4·03 | −0·71 |

wives (0·099/0·527) would increase their hours of work to 35 or more hours per week. Among wives without spousal benefits, 60·9% work 35 or more hours per week. If a sample of these wives gained spousal benefits, the estimates suggest 16% (0·099/0·609) of these wives would shift to part-time employment or leave the labour force.

The results shown in Figure 5(b) can be further partitioned into the effect of spousal benefits on the movement of wives between part-time and full-time employment and the effect of spousal benefits on shifts between zero hours and full-time employment. For this decomposition I assume the difference in the CDFs from one through 34 hours is due to shifts between part-time and full-time employment caused by spousal coverage. This also implies the difference in the labour force participation rate minus the differences in the CDFs at 40 hours per week is attributable to shifts from out of the labour force to full-time employment due to spousal coverage. This partitioning is shown in Figure 5(b) and it implies that the probability a wife with spousal coverage moves from zero hours to full-time employment if spousal coverage is lost equals 0·10 (e.g. 0·033/0·328). Similarly, the probability a wife working part-time with spousal benefits moves to full-time employment if spousal benefits are lost is 0·33 (e.g. 0·067/0·199). Alternatively, the probability a wife working full-time without spousal benefits will drop out of the labour force if spousal coverage becomes available is 0·054 (e.g. 0·033/0·609) and the probability she would move to part-time hours is 0·11 (e.g. 0·066/0·609). The greater responsiveness of wives working part-time to changes in spousal benefits compared to wives out of the labour force suggests that wives out of the labour force are less likely to move to full-time employment when benefits are lost because the household adjustment costs required to change hours are greater for these wives than for wives already working part-time.

## 7. COMPARING THE SEMIPARAMETRIC AND PARAMETRIC ESTIMATES

Table IV compares the semiparametric estimates to the parametric estimates reported in Table II. For each statistical model a set of sample weighted mean predicted labour supply measures were calculated. For the parametric models, the labour supply measures for $f(\text{hours} \mid I_{HHI} = 0, I_Z = 0)$ and $f(\text{hours} \mid I_{HHI} = 1, I_Z = 0)$ were calculated for the sample of wives without spousal coverage. The measures for $f(\text{hours} \mid I_{HHI} = 0, I_Z = 0)$ were calculated by setting $HHI$ to zero for wives without spousal coverage and the labour supply measures for $f(\text{hours} \mid I_{HHI} = 1, I_Z = 0)$ were calculated by setting $HHI$ to one for wives without spousal coverage. Calculating these predicted values over the sample without spousal coverage was done to make the comparison between the parametric and non-parametric estimates comparable. The counterfactual distribution shown in Figure 5(a) is an estimate of the hours distribution for those with spousal coverage assuming these workers had a distribution of $Z$s comparable to the distribution of $Z$s found among workers without spousal coverage. Therefore, the appropriate comparisons are between the counterfactual distribution and the average effects of spousal coverage from the parametric models calculated over the sample of wives without spousal coverage.

Table IV contrasts the estimated mean effects of spousal coverage on the labour supply of wives under five different specifications. The first four columns of numbers in Table IV show the differences between the semiparametric estimates shown in Figures 5(a) and 5(b) and the different parameter models.[6] The probit models overstate the difference in labour force participation

[6] The results in the last column of Table IV are discussed in Section 10. Estimates from the binary probit model for labour force participation are not shown in Table IV because these estimates were virtually identical to the three-group ordered probit model.

attributable to spousal coverage (row c). The estimated effects from the probit models are almost 50% larger than the semiparametric estimate of 0·069. On the other hand, semiparametric and Tobit models give very similar estimates of the effect of spousal coverage on labour force participation. Compared to the semiparametric estimates, all three parametric models significantly understate the effect of spousal coverage on the probability wives will work part-time (row f). The 0·067 effect for the semiparametric model is substantially larger than the 0·016 to 0·022 estimates from the ordered probit and Tobit models. Finally, all the parametric models understate the effect of spousal converge on the probability of 35 or more hours per week (row h), though the probit model estimates are much closer to the semiparametric model than is the estimate from the Tobit model.

Rows j–o break down the differences in full-time employment by spousal coverage into an effect on the probability of working 35 to 40 hours per week and the probability of working more than 40 hours per week. The −0·099 value for the semiparametric model (row j) corresponds to the convergence in the CDFs over the 35–40-hour interval that is shown graphically in Figure 5(b). The four-group ordered probit model gives a significantly smaller estimate (−0·060) of the impact of spousal coverage on the average probability wives work 35–40 hours per week. The Tobit model predicts spousal coverage *increases* the probability wives will work 35–40 hours per week!

The last nine rows of Table IV show estimates of the impact of spousal coverage on expected hours of work based on the semiparametric and Tobit models. Rows p–r are the expected hours per week including the probability that wives may be out of the labour force. Rows s–u show expected hours given participation in the labour force and rows v–x are expected hours given part-time employment. With respect to all three of these measures of labour supply, the Tobit model significantly overstates the effect of spousal coverage when compared to the semiparametric model.

## 8. ESTIMATES FROM THE ALTERNATIVE COUNTERFACTUAL DISTRIBUTION

The mean effects in Table IV for the parametric models were over the sample of wives without spousal coverage. The semiparametric estimates of $f(\text{hours} \mid I_{HHI} = 0,\ I_Z = 0)$ were also calculated from the sample of wives without spousal coverage and the counterfactual distribution, $f(\text{hours} \mid I_{HHI} = 1,\ I_Z = 0)$, was calculated using the sample of wives with spousal coverage. As equation (3) shows, the difference between $f(\text{hours} \mid I_{HHI} = 0,\ I_Z = 0)$ and $f(\text{hours} \mid I_{HHI} = 1,\ I_Z = 0)$ is the portion of the difference in hours not attributable to the $Z$ attributes and due to spousal coverage or omitted variables correlated with spousal coverage. As in the decomposition of mean differences in the linear regression model, there is an alternative decomposition of the differences between $f(\text{hours} \mid I_{HHI} = 0,\ I_Z = 0)$ and $f(\text{hours} \mid I_{HHI} = 1,\ I_Z = 1)$ that may give a different answer from equation (3). This decomposition can be written as

$$\begin{aligned} f(\text{hours} \mid HHI = 0) - f(\text{hours} \mid HHI = 1) &= f(\text{hours} \mid I_{\text{HHI}} = 0, I_Z = 0) \\ &\quad - f(\text{hours} \mid I_{\text{HHI}} = 0, I_Z = 1) \\ &\quad + [f(\text{hours} \mid I_{\text{HHI}} = 0, I_Z = 1) - f(\text{hours} \mid I_{\text{HHI}} = 1, I_Z = 1)] \qquad (6) \end{aligned}$$

The term in square brackets in equation (6) describes the difference in hours for those with spousal coverage and the counterfactual distribution for wives without spousal coverage that would exist if these wives had $Z$ attributes that matched the distribution among wives with spousal coverage. The differences between these two distributions provide another set of semiparametric estimates of the effects of spousal coverage.[7] These alternative semiparametric estimates can then be compared to the mean effects of spousal coverage calculated over the sample of wives with spousal coverage using estimates from the parametric models and the semiparametric estimates presented in Section 7.

Table V shows the estimates using these alternative comparisons. The pattern of results in Table V is roughly similar to the pattern in Table IV. The probit models come closest to the semiparametric estimates of the effect of spousal coverage on labour force participation. All the parametric models significantly understate the effect of spousal coverage on the probability of working part-time and the Tobit model substantially underestimates the effect of spousal coverage on the probability of working full-time relative to any of the other three models.

There are, however, three noteworthy differences between Tables IV and V. The estimate in Table V of the effect of spousal coverage on the probability of working full-time from the alternative semiparametric model is much closer to the four-group ordered probit model (e.g. 0·072 versus 0·066) (row l) than in Table IV (e.g. −0·099 versus −0·060). Second, the effect on spousal coverage on the probability of working more than 40 hours per week (row o) is greater in the semiparametric than in the parametric models in Table V. In Table IV the semiparametric estimate of the effect is smaller. Finally, in Table V the impact of spousal coverage on alternative measures of expected hours (rows r, u and x) are greater for the semiparametric model than for the Tobit model. In Table IV this difference is reversed.

A useful way of integrating the results in Tables IV and V is to calculate the average effects for the two decompositions of the probabilities that a wife without spousal coverage would move from full-time to less than full-time if she were to gain spousal health benefits. Based on the estimates in Table IV this probability is equal to the 0·163 and equals the probability wives without spousal benefits work full-time (e.g. 0·609) divided by the fraction of workers who would shift from full-time to part-time if they gained coverage (0·099). The comparable calculation from Table V is 0·119. Thus, the average predicted probability a woman working full-time without spousal coverage would shift to less than full-time employment is 0·141. A similar calculation was done to determine the average probability a wife with spousal coverage would shift from less than full-time employment to full-time work if she lost spousal coverage. This probability is 0·188 from Table IV (e.g. 0·099/0·527) and 0·129 from Table V (e.g. 0·072/0·558). The average estimate of this probability is 0·158. Finally, the average difference between those with and without spousal coverage in hours worked per week given that hours worked are less than or equal to 40 hours is −4·23 hours.

## 9. SEMIPARAMETRIC ESTIMATES OF HOURS WORKED CONDITIONAL ON WORKING

The estimates reported in the two preceding sections of the effect of spousal coverage on wives' labour supply decisions assumes the reason that wives without spousal coverage are more likely to be working full-time than wives with spousal coverage is because of the health benefits

[7] The two counterfactual distributions are not independent estimates of the effects of spousal coverage because the reweighting variable for both counterfactual distribution is based on the same underlying probit model describing spousal coverage in the total sample. Also note than the reweighting variable used to estimate the counterfactual distribution is defined differently and is equal to $\{\Pr(HHI = 1 \mid Z)/\Pr(HHI = 0)\}/\{\Pr(HHI = 0 \mid Z)/\Pr(HHI = 1)\}$.

Table V. Predicted mean effects of spousal coverage on alternative measures of labour supply and alternative statistical models estimated over the sample of wives with spousal coverage

| | The treatment defined by *HHI*: | | | | Treatment defined by *HHI2*: |
|---|---|---|---|---|---|
| Measure of labour supply | Ordered probit NLF/PT/FT | Ordered probit NLF/PT/35–40/ > 40 | Tobit model | Semiparametric model | Semiparametric model |
| (a) $\Pr(\text{Hrs} = 0 \mid I_Z = 1, I_{HHI} = 1)$ | 0·354 | 0·347 | 0·235 | 0·339 | 0·295 |
| (b) $\Pr(\text{Hrs} = 0 \mid I_Z = 1, I_{HHI} = 0)$ | 0·241 | 0·244 | 0·163 | 0·238 | 0·270 |
| (c) Difference | 0·113 | 0·103 | 0·072 | 0·100 | 0·025 |
| (d) $\Pr(0 < \text{Hrs} < 35 \mid I_Z = 1, I_{HHI} = 1)$ | 0·189 | 0·189 | 0·516 | 0·219 | 0·198 |
| (e) $\Pr(0 < \text{Hrs} < 35 \mid I_Z = 1, I_{HHI} = 0)$ | 0·170 | 0·172 | 0·495 | 0·124 | 0·098 |
| (f) Difference | 0·019 | 0·017 | 0·021 | 0·095 | 0·099 |
| (g) $\Pr(\text{Hrs} >= 35 \mid I_Z = 1, I_{HHI} = 1)$ | 0·457 | 0·464 | 0·250 | 0·404 | 0·507 |
| (h) $\Pr(\text{Hrs} >= 35 \mid I_Z = 1, I_{HHI} = 0)$ | 0·588 | 0·584 | 0·343 | 0·606 | 0·632 |
| (i) Difference | −0·132 | −0·120 | −0·093 | −0·201 | −0·125 |
| (j) $\Pr(35 <= \text{Hrs} <= 40 \mid I_Z = 1, I_{HHI} = 1)$ | | 0·390 | 0·051 | 0·359 | 0·407 |
| (k) $\Pr(35 <= \text{Hrs} <= 40 \mid I_Z = 1, I_{HHI} = 0)$ | | 0·456 | 0·071 | 0·432 | 0·512 |
| (l) Difference | | −0·066 | −0·020 | −0·072 | −0·105 |
| (m) $\Pr(\text{Hrs} > 40 \mid I_Z = 1, I_{HHI} = 1)$ | | 0·074 | 0·190 | 0·083 | 0·100 |
| (n) $\Pr(\text{Hrs} > 40 \mid I_Z = 1, I_{HHI} = 0)$ | | 0·128 | 0·272 | 0·206 | 0·120 |
| (o) Difference | | −0·054 | −0·082 | −0·123 | −0·020 |
| (p) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 1)$ | | | 21·51 | 22·96 | 25·30 |
| (q) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 0)$ | | | 26·87 | 30·51 | 28·38 |
| (r) Difference | | | −5·36 | −7·55 | −3·07 |
| (s) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 1, \text{Hrs} > 0)$ | | | 27·05 | 34·71 | 35·92 |
| (t) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 0, \text{Hrs} > 0)$ | | | 31·15 | 40·06 | 38·88 |
| (u) Difference | | | −4·11 | −5·35 | −2·96 |
| (v) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 1, 0 < \text{Hrs} < 35)$ | | | 17·60 | 21·95 | 22·90 |
| (w) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 0, 0 < \text{Hrs} < 35)$ | | | 18·79 | 23·26 | 22·20 |
| (x) Difference | | | −1·20 | −1·31 | 0·70 |
| (y) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 1, \text{Hrs} <= 40)$ | | | 15·33 | 20·62 | 22·65 |
| (z) $E(\text{Hrs} \mid I_Z = 1, I_{HHI} = 0, \text{Hrs} <= 40)$ | | | 17·96 | 25·06 | 25·52 |
| (aa) Difference | | | −2·63 | −4·43 | −2·87 |

available to full-time workers that are typically not available to part-time workers. If the major difference in $f$(hours) between wives with and without spousal coverage is because wives without spousal benefits work full-time to obtain health benefits through an employer, then the counterfactual distribution controlling for both the $Z$s and whether or not the wife has coverage through her own job ($WHI$) should look very similar to the hours distribution for wives without spousal coverage. To test this prediction the two distributions, $f(\text{hours} \mid I_{HHI} = 1, I_Z = 0)$ and $f(\text{hours} \mid I_{HHI} = 1, I_{Z,WHI} = 0)$, were re-estimated using only the subsample of working wives.

Figures 6(a) and 6(b) present the results from this exercise. Since wives not in the labour force are excluded from these estimates, the CDFs are identical at 0 hours and then diverge due to the effects of $HHI$. Figure 6(a) shows the counterfactual distribution after accounting for the variables included in the $Z$ matrix. The middle line in Figure 6(a) shows how $F(\text{hours} \mid HHI = 1)$ is altered if wives with spousal benefits had the distribution of $Z$ variables corresponding to the distribution among wives that lacked spousal coverage. Consistent with the results from the full sample, this figure shows the $Z$ variables explain only a small share of the difference in the probability that wives in these two subsamples work part-time (less than 35 hors per week). For example, $\Pr(\text{hours} = 35 \mid HHI = 1)$ equals 0·389, $\Pr(\text{hours} = 35 \mid HHI = 0)$ equals 0·230 and $\Pr(\text{hours} = 35 \mid I_{HHI} = 1, I_Z = 0)$ equals 0·356. Thus, only about 21% of the difference in the probability of working 35 or fewer hours is accounted for by differences in exogenous characteristics of the wives and their families.

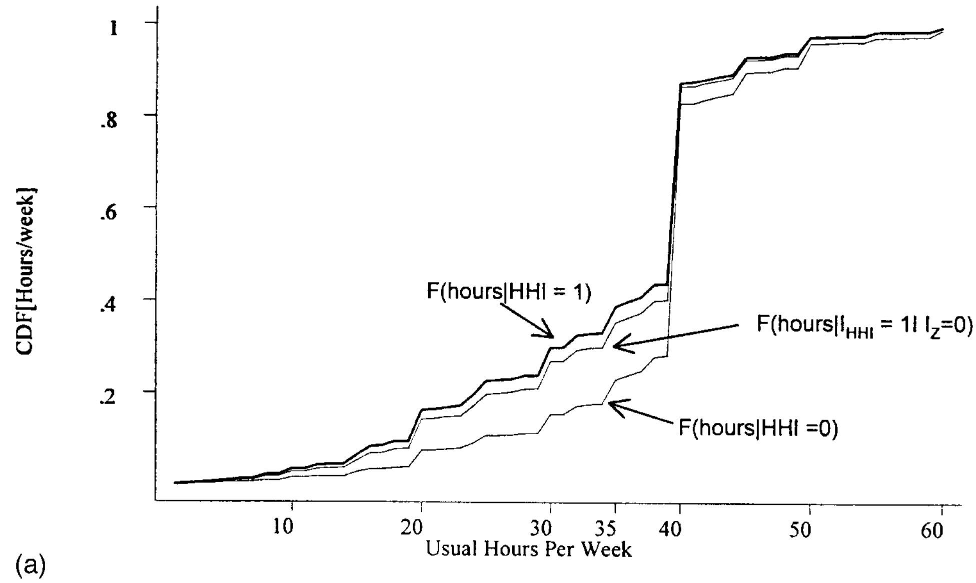
Figure 6(b) adds $WHI$ to the set of controls. The middle line in Figure 6(b) accounts for the distribution of both the $Z$ variables and $WHI$. When $WHI$ is added most of the differences between the two distributions disappear. For example, controlling for both the exogenous $Z$ variables and $WHI$ successfully accounts for 91% of the difference between $F(\text{hours} = 35 \mid HHI = 1)$ and $F(\text{hours} = 35 \mid HHI = 0)$. This figure suggests the primary reason the hours distributions differ by spousal coverage is because wives without spousal coverage are more likely work full-time and in order to have a job that provides health benefits.

## 10. THE ENDOGENEITY OF HUSBANDS' HEALTH BENEFITS

The preceding results suggest that wives without spousal coverage either because their husband lacked health benefits or because they were not covered by their husbands' benefits will reduce their labour supply if they gained health coverage through their husbands' compensation package for some exogenous reasons. Treating a husband's health insurance coverage through his employer and whether or not his wife is covered by his policy as exogenous to her job choices and labour supply decisions is problematic. For example, in some households wives in the labour force may be in jobs that provide health insurance and therefore the couple may decide not to cover her under his policy or the husband may choose a job without coverage and receive coverage through his wife's employer. The joint determination in the household of jobs, labour supply and health insurance benefits means the estimates reported above overstate the impact changing spousal coverage has on the labour supply decisions of wives.

There is little that can be done to convincingly address this issue in cross-sectional data like that which is used in this study. I can, however, provide an alternative estimate of the effect of spousal coverage on the labour supply decisions of wives than is likely to understate the true effect of spousal coverage on the labour supply decisions of wives. Recall that these wives without spousal coverage ($HHI = 0$) include households where the husband has health insurance but his wife is uncovered by his policy. Instead of including these wives with the sub-sample of wives



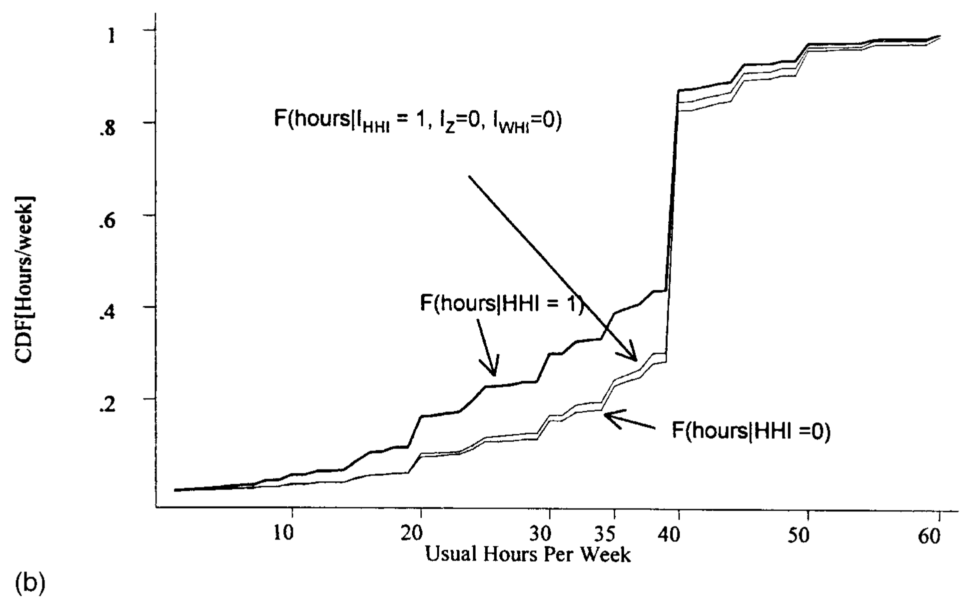




Figure 6. (a) CDF of hours adjusted for *Z*s for working wives. (b) CDF of hours adjusted for *Z*s and wife's own coverage

married to men who do not have any health insurance through their employer, I now include these wives with the subsample of wives who are covered by their husband's health insurance policy. I then re-estimate the semiparametric models were re-estimated using this redefined 'treatment variable'.

Define a new indicator variable *HHI2* which equals '1' if the husband is covered by health insurance through his job and '0' otherwise. If wives who are not covered by their husband's health insurance benefits are more likely to work full-time to gain coverage for themselves, including these households with couples where the wife is covered by her husband's policy implies that $E(\text{hours} \mid HHI2 = 1) > E(\text{hours} \mid HHI = 1)$. If wives married to husbands without any health benefits work as many hours as wives married to husbands who have benefits for themselves but not their wives (e.g. $E(\text{hours} \mid HHI2 = 0) = E(\text{hours} \mid HHI = 0)$), then the estimated effect (unconditional on the $Z$ attributes) of spousal coverage on the labour supply decisions of wives are smaller using the *HHI2* than *HHI*:

$$E(\text{hours} \mid HHI2 = 0) - E(\text{hours} \mid HHI2 = 1) < E(\text{hours} \mid HHI = 0) - E(\text{hours} \mid HHI = 1)$$

The use of *HHI2* as the 'treatment effect' of spousal coverage on the labour supply decisions of wives is also likely to understate the true effect of spousal coverage because it assumes that the labour supply decisions of wives working full-time with their own health benefits but who are not covered by their husbands' policy are unaffected by the fact that they are not covered by their husbands' insurance. In other words, using *HHI2* as the treatment indicator implies that none of the wives for which $HHI = 0$ and $HHI2 = 1$ would reduce their labour supply if they were to gain coverage through their husband's job for some exogenous reason. If some of these wives were to adjust their labour supply if they gained spousal coverage, $E(\text{hours} \mid HHI2 = 0) - E(\text{hours} \mid HHI2 = 1)$ will understate the effects of spousal coverage on labour supply. For this reason, I believe $E(\text{hours} \mid HHI2 = 0) - E(\text{hours} \mid HHI2 = 1)$ and $E(\text{hours} \mid HHI = 0) - E(\text{hours} \mid HHI = 1)$ bracket the true effect of spousal coverage on the labour supply decisions of wives.

The effects of spousal coverage on labour supply using *HHI2* were calculated from semi-parametric estimates of $f(\text{hours} \mid J_{\text{HOURS}} = 0,\ J_Z = 1)$, $f(\text{hours} \mid J_{\text{HOURS}} = 1,\ J_Z = 0)$, $f(\text{hours} \mid J_{\text{HOURS}} = 1,\ J_Z = 1)$ and $f(\text{hours} \mid J_{\text{HOURS}} = 0,\ J_Z = 0)$ where $J_i = 1$ if the variable comes from the distribution where $HHI2 = 1$ and $J_i = 0$ if the variable comes from the distribution where $HHI2 = 0$. The last columns of Tables IV and V show the semiparametric estimates of labour supply using *HHI2*. The estimates in this column should be compared with the results in the first column where the effect of spousal coverage is estimated semiparametrically using *HHI*.

As anticipated, the effects of spousal coverage on labour supply are substantially smaller when *HHI2* is used. There is now very little difference in the labour force participation rates between the counterfactual distributions and $f(\text{hours} \mid J_{\text{HOURS}} = 1,\ J_Z = 1)$ or $f(\text{hours} \mid J_{\text{HOURS}} = 0,\ J_Z = 0)$. The magnitude of the effect of spousal coverage on the probability of working 35 or more hours per week (row i) is reduced from 0·136 to 0·057 in Table IV and from 0·201 to 0·125 in Table V. While the differences in the probability of working 35 through 40 hours per week decline from 0·099 to 0·037 in Table IV (row $\ell$), the probabilities increase slightly from 0·072 to 0·105 in Table V. Thus, the mean effect of spousal coverage on the probability of working 35–40 hours per week is 0·085 using *HHI* (e.g. $(0{\cdot}099 + 0{\cdot}072)/2$) and 0·071 using *HHI2* (e.g. $(0{\cdot}037 + 0{\cdot}105)/2$).

The first and last columns show the expected difference $s$ in hours attributable to spousal coverage are smaller using *HHI2* than *HHI*. The mean difference in expected hours (row p) using attributable to spousal coverage using *HHI* was 6·03 (e.g. $4{\cdot}51 + 7{\cdot}55)/2$) and 4·77 (e.g. $3{\cdot}07 + 1{\cdot}70)/2$) using *HHI2*. If the mean difference in hours beyond 40 hours per week between those with and without spousal coverage is due to omitted variables correlated with spousal coverage, then the relevant measure of the impact of spousal coverage is the difference in expected hours of work given expected hours are less than or equal to 40. These calculations are shown in row aa. Using *HHI* the mean expected difference in hours due to spousal coverage is 4·23 (e.g. (4·03 + 4·43)/2) while the comparable figure using *HHI2* is 1·78 hours (e.g. (0·71 + 1·87)/2).

## 11. SUMMARY AND CONCLUSIONS

This study investigated how the health benefits wives receive through their husbands' compensation package affects their labour supply decisions. Wives without spousal coverage are more likely to work full-time compared to wives with spousal coverage because wives without spousal coverage are more likely to demand a job with health benefits and will usually have to work full-time to gain these benefits. The parametric and semiparametric estimates support this conclusion, though the parametric estimates of the effects of spousal coverage on wives' labour supply decisions are smaller than the semiparametric estimates.

Using the semiparametric decomposition method developed by DiNardo *et al.* (1996), the preferred estimates suggest the changes in the probabilities of working full-time attributable to changes in spousal coverage range from 0·071 to 0·085. The predicted mean effect of spousal coverage on hours per week given that hours are less than or equal to 40 hours ranged from a lower-bound estimate of 1·78 hours using *HHI2* to 4·23 hours using *HHI*. The lower-bound estimates of 0·071 and 1·78 hours are based on an estimate where the spousal coverage variable is defined by whether the husband has health insurance coverage through his job (*HHI2*). This is a lower-bound estimate because it assumes none of the wives married to husbands who have health insurance that does not cover them would change their labour supply decisions if they were to gain spousal coverage. The upper-bound estimates of 0·085 and 4·23 hours are based on estimates where spousal coverage is based on whether the wife is covered by her husband's health insurance policy (*HHI*). Wives may be uncovered by their husbands' health insurance ($HHI = 0$) either because the husbands lack health insurance or because they have health insurance but their wives are not covered. Some wives in this latter category may not be covered by their husbands' policies because of their own job and labour supply choices and their labour supply decisions would be unchanged if they gained spousal coverage. For this reason, the estimates using *HHI* over-estimate the impact of an exogenous change in spousal coverage on the labour supply decisions of wives.

The two specifications of spousal coverage using *HHI* and *HHI2* each provide a pair of estimates of the probability a wife without spousal coverage working full-time would decide to work less than full-time if they gained spousal coverage. The mean estimate of this probability from the two decompositions using *HHI2* is 0·120 and the mean estimate of the probability using *HHI* is 0·141. The two specifications also provide a pair of estimates of the probability a wife with spousal coverage would shift from full-time employment to less than full-time employment if she gained spousal coverage. Using *HHI* the average probability is 0·158 and 0·143 using *HHI2*. Thus, both *HHI* and *HHI2* give very similar estimates of these transitional probabilities.

The underlying model for the statistical work presented in this paper assumes wives sort themselves into jobs based on their demand for employer-provided health benefits given the common employer constraint that health benefits are only provided to full-time workers and given the health insurance provided through their husbands' employers. In many households the health benefits that husbands receive through their jobs are unlikely to be exogenous to the job choices of wives. Joint household decision making with respect to jobs and health insurance coverage suggest the estimates in this study are likely to be biased estimates of the true causal effect of a husband's health insurance benefits on his wife's labour supply decisions. While I believe the estimates using *HHI* and *HHI2* bracket the true causal effect of spousal health insurance on the labour supply decisions of wives, a useful direction for future research would be to estimate the responsive of wives' labour supply decisions to changes in spousal benefits using panel data where job changes and changes in spousal coverage can be directly observed. Such an analysis will have its own set of problems because changes in spousal benefits are likely to be highly correlated with other important household changes (e.g. displaced worker wage effects). This will make separating the impact of changing spousal benefits from other changes in family circumstances that affect labour supply a challenging but valuable undertaking.

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## REFERENCES

DiNardo, J., N. M. Fortin and T. Lemieux (1996), 'Labour market institutions and the distribution of wages: 1973–1992: a semi-parametric approach', *Econometrica*, **64**, September, 1001–1044.

Goldberger, A. (1983), 'Abnormal selection bias' in *Studies in Econometrics: Time Series and Multivariate Statistics*, Karlin, S., T. Amemiya and L. A. Goodman (Eds), Academic Press, New York, 67–84.

Oaxaca, R. (1973), 'Male–female wage differentials in urban labor markets', *International Economic Review*, **14**, (October, 693–709.

Rosen, S. (1986), 'The theory of equalizing differences', in Ashenfelter, C. and Richard Layard (Eds), *Handbook of Labour Economics*, Volume 1, North-Holland, Amsterdam.

Sheather, S. and M. Jones (1991), 'A reliable data-based bandwidth selection method for kernel density estimation', *Journal of the Royal Statistical Society, B*, **53**, 683–690.

US Bureau of the Census (1996), *Health Coverage: 1995*, Current Population Reports, P60-195, September.

 