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Cathy J. Bradley
David Neumark
Zhehui Luo
Heather L. Bednarek

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Cathy J. Bradley
Virginia Commonwealth University

David Neumark
Public Policy Institute of California and IZA Bonn

Zhehui Luo
Michigan State University

Heather L. Bednarek
St. Louis University

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
Email: iza@iza.org

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ABSTRACT

Employment-Contingent Health Insurance, Illness and Labor Supply of Women: Evidence from Married Women with Breast Cancer*

We examine the effects of employment-contingent health insurance on married women's labor supply following a health shock. First, we develop a theoretical model that examines the effects of employment-contingent health insurance on the labor supply response to a health shock, to clarify under what conditions employment-contingent health insurance is likely to dampen the labor supply response. Second, we empirically evaluate this relationship using primary data. The results from our analysis find that – as the model suggests is likely – health shocks decrease labor supply to a greater extent among women insured by their spouse's policy than among women with health insurance through their own employer. Employment-contingent health insurance appears to create incentives to remain working and to work at a greater intensity when faced with a serious illness.

JEL Classification: I12, J22

Keywords: health insurance, health shock, cancer, labor supply

Corresponding author:

David Neumark
Public Policy Institute of California
500 Washington St., Suite 800
San Francisco, CA 94111
USA
Email: neumark@ppic.org

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1. Introduction

For the majority of non-elderly Americans, health insurance is either contingent upon their own employment or dependent upon the employment of a family member such as a spouse or parent (Kaiser Family Foundation, 2004). Past research has examined the labor supply behavior of individuals who have employment-contingent health insurance (Cooper and Monheit, 1993; Gruber and Madrian, 1994; Kapur, 1998; Adams, 2004) and of individuals dependent upon another's policy (Wellington and Cobb-Clark, 2000; Buchmueller and Valletta, 1999; Chou and Staiger, 2001). The effects of health on labor supply have also been studied (examples include Bradley et al., 2005; Stern, 1989; Ettner et al., 1997; Vijan et al., 2004). Absent from this literature, however, is an assessment of how the two—health and employment-contingent health insurance—interact to alter labor supply after an adverse health shock is experienced by an otherwise healthy employed individual.[1] Such information would help policy makers understand some of the incentives and possible pitfalls of employment-contingent health insurance that influence the trade-offs between work and recovery following illness.

An adverse health shock creates a need for convalescence, but with employment-contingent health insurance an individual may need to continue working in order to preserve the insurance to cover current medical expenses, and to minimize risk for financial loss in the future—risk likely perceived as greater because of the health shock. Because many women obtain insurance through their spouse's employment, while many others obtain it through their own employment, the labor supply response of women to illness—and how that response depends on the source of the health insurance—provides a natural context for studying this question. We collected data with which to compare the effects of a health shock, namely breast cancer, on the labor supply of married women 6, 12, and 18 months following diagnosis, relative to their labor supply prior to diagnosis, depending on whether health insurance comes through the spouse's employment or the woman's employment.

[1] One study (Coile, 2004) approaches the analysis of health, health insurance, and labor supply by including access to one's own or a spouse's retiree health benefits, and interactions with health shocks, as independent variables in an equation predicting labor supply response following a health shock. She does not find that access to these health benefits increases the labor supply response to a health shock. However, employed older workers with access to retiree health benefits—possibly from another job—may be an unusual group from which results do not generalize to the rest of the population.

Breast cancer is an important health condition to study for three main reasons: its occurrence is nearly random and women are treated with similar regimens of surgery, chemotherapy, and radiation based on cancer stage at diagnosis; it is a prevalent disease affecting working age women; and there is a concerted national effort dedicated to reducing breast cancer's burden. An estimated 55,700 in situ breast cancer cases were detected in 2003, with approximately 75% of these cases detected in women under age 65; and approximately 65% of all invasive breast cancer cases (nearly 137,345 cases) were detected in women under age 65 in 2003 (American Cancer Society, 2003). The National Cancer Institute, along with other clinical guideline-setting bodies, has recommended that women age 40 and over receive an annual mammogram (National Cancer Institute, 2005; U.S. Preventive Services Task Force, 2005). Thus, early detection has become the mantra of many health professionals. Nevertheless, the economic context—which can potentially thwart or enhance early detection and treatment efforts—requires further attention. An examination of how affected employed women change their labor supply and whether this change is dependent on their source of health insurance lends insight into both the disease burden and the policy context in which early detection and treatment efforts are implemented.

This paper is organized as follows: first, we formulate a theoretical model of how a health shock might alter labor supply, and how this response varies when health insurance is contingent upon employment; second, we describe the samples used for the empirical investigation; third, we present our methods for the empirical analysis; fourth, we show our results; and finally, we discuss potential policy implications of our findings.

2. Health, health insurance, and labor supply

Our research addresses how health and employment-contingent health insurance interact to alter labor supply after an adverse health shock is experienced by an otherwise healthy, employed individual. Intuitively, poor health, in the absence of health insurance or concerns for future financial loss, reduces labor supply (Coile, 2004; Bradley et al., 2005; Stern, 1989; Ettner et al., 1997; Vijan et al., 2004). This issue has been explored in some depth with research showing that individuals' job type (e.g., skill level), access to disability pensions, workplace resources (e.g., flexible work schedules, generous sick leave), and demands regarding family roles (e.g., primary source of family income) influence the probability that an adverse health shock will move an individual from employment to non-employment (McDonough and Amick, 2004; Burkhauser and Daly, 1996).

Health insurance, which is correlated with job type, workplace resources, and family roles, also has a powerful influence on labor supply because it provides access to health care and reduces near-term medical expenses and the risk of future financial loss due to illness. An extensive literature has examined the relationship between health insurance and labor supply with regard to job lock (Cooper and Monheit, 1993; Gruber and Madrian, 1994; Kapur, 1998; Pauly, 1997; Adams, 2004). Other research has shown that married women's labor supply decreases when they are dependents on their husband's health insurance policies (Olson, 1995; Wellington and Cobb-Clark, 2000; Buchmueller and Valletta, 1999; Chou and Staiger, 2001).

Health status and health insurance and their joint effect on labor supply have not been well developed in the literature. The theoretical framework of Becker (1964) and Grossman (1972) supports the intuition that poor health decreases labor supply by diminishing tastes for work, raising the marginal value of leisure time, and increasing time required for health maintenance. However, when an ill employee has insurance, the employee has some protection against health-related financial loss. Under this circumstance, if the insurance is contingent upon continued employment, an employee may forego health care or convalescence that requires extended time away from work and instead devote time towards work in order to preserve health insurance coverage. We now explore more fully the labor supply responses to a health shock, and how they may depend on the source of health insurance.

We begin with the utility function

$$\text{Maximize } U = U(C,L,H) \qquad (1)$$

where C is consumption, L is leisure, and H is health, with utility strictly increasing in each of its arguments. U is differentiable and is quasi-concave. The health production function is

$$H = H(L,M) \qquad (2)$$

given inputs of L (which may be thought of as convalescence) and M, which represents medical goods (or services). Health is strictly increasing in L and M, and H is differentiable and is quasi-concave. We can then substitute for H to obtain

$$\text{Maximize } U' = U'(C,L,H(L,M)) = U'(C,L,M), \quad (3)$$

which we assume satisfies the same properties as U. For example, suppose U(C,L,H) and H(L,M) take Cobb-Douglas forms where

$$U = C^{\rho}L^{\sigma}H^{\upsilon} \quad (4)$$

$$H = L^{\sigma'}M^{\upsilon'} \quad (5)$$

so that

$$U' = C^{\rho}L^{\sigma}(L^{\sigma'}M^{\upsilon'})^{\upsilon} = C^{\rho}L^{\sigma+\sigma'\upsilon}M^{\upsilon'\upsilon}. \quad (6)$$

We can then re-write equation (6) as

$$U' = C^{\alpha}L^{\beta}M^{\gamma}. \quad (7)$$

The full-income budget constraint is

$$wT + y = wL + p_C C + p_M M(1\text{-}\tau(L)) \quad (8)$$

where w is wages, p_C is the price of the consumption good, p_M is the price of medical goods, T is the endowment of time, y is exogenous income, and $\tau(L)$ is the share of the cost of medical goods paid by insurance. If a woman has her health insurance through her employer (employment-contingent health insurance), then $\tau(L) = \tau$ if H' < T – L, and equals 0 otherwise. That is, insurance pays a fixed share of costs subject to some minimum labor supply constraint (H'). Alternatively, if the woman has health insurance through a spouse, then $\tau(L) = \tau$ regardless of the choice of L (treating the husband's labor supply as exogenous and fixed). The budget constraint will have different segments, so the agent must optimally choose between labor supply and leisure and between the consumption of goods and of medical services along each possible budget constraint, and then choose the global optimum.

Consider the case when a woman is a dependent on the health insurance of an employed spouse. The constrained optimization problem is to maximize

$$\mathsf{L} = C^{\alpha}L^{\beta}M^{\gamma} + \lambda_y(wT + y - wL - p_C C - p_M M(1\text{-}\tau)) + \lambda_T(T - L), \quad (9)$$

where λ_y and λ_T are the Lagrange multipliers for the budget and time constraints. We can ignore the constraints that L, C, and M be positive, because with a Cobb-Douglas utility function the slopes of the indifference curves are infinite at the zero axes, so zero consumption is never optimal. For an interior solution, the partial derivatives of $\mathcal{L}$ with respect to C, M, and L are set to zero. Solving these equations and the budget constraint for C, M, L, and λ_y yields standard Cobb-Douglas demands

$$C^* = (\alpha/[\alpha + \beta + \gamma])\cdot([wT + y]/p_C) \quad (10)$$

$$M^* = (\gamma/[\alpha + \beta + \gamma])\cdot([wT + y]/p_M[1\text{-}\tau]) \text{ and} \quad (11)$$

$$L^* = (\beta/[\alpha + \beta + \gamma])\cdot([wT + y]/w). \quad (12)$$

In this case, a constant share of full income is spent on C, M, and L, regardless of prices.

Now consider a health shock, which we conceptualize as doing two things: reducing the utility from consumption and leisure as well as the overall utility from any bundle (C, L, H), and increasing the relative contribution of L and M to utility through increased contributions of these inputs to health. In the utility function (4) the health shock lowers ρ and σ, and in the health production function (5) it raises σ' and υ'. Thus, in the utility function rewritten as (7), α clearly falls, γ clearly rises, and β, which equals $\sigma+\sigma'\upsilon$, may fall or rise, although it is more likely to rise if the reduction in utility from leisure (the decline in σ) is outweighed by the increase in the contribution of leisure to health weighted by the contribution of health to utility (the increase in σ' multiplied by υ). Furthermore, if the utility associated with any bundle (C, L, H) falls, then $(\alpha + \beta + \gamma)$ falls. Thus, for an interior solution, equations (10) through (12) imply that an adverse health shock, through its effect on the utility function and the health production function, increases M, and if β increases the health shock increases L as well.

We might also imagine that a health shock reduces productivity and therefore w. At the interior solution where the individual works, this generates an income effect on C and M, hence decreasing them, but an income and substitution effect on L. In the case of the Cobb-Douglas utility function, the substitution effect dominates, as $\partial\{(wT + y)/w\}/\partial w = -y/w^2$. This reflects the property that with the Cobb-Douglas utility function, a fixed share of full income is spent on each "good," so that a lower wage implies more leisure, as long as $y > 0$. Thus, the effect of the health shock acting through a lower wage makes it more likely that labor supply will fall in response to the shock.

As this discussion indicates, there is not a firm prediction for the effect of a health shock on labor supply, although a negative effect is more likely when (a) the health shock reduces the wage, and (b) the health shock does relatively more to increase the contribution of leisure to health and, via that channel, to utility, than it does to directly reduce the utility from leisure.

The important boundary solution to consider is whether the woman chooses not to work, or $L = T$. In this case, according to the Kuhn-Tucker condition for this part of the problem,

$$\beta C^{\alpha}L^{\beta-1}M^{\gamma} - w\cdot([\alpha + \beta + \gamma]\cdot[C^{\alpha}L^{\beta}M^{\gamma}]/[wT + y]) = \lambda_T > 0, \quad (13)$$

which after some manipulation implies that

$$L < (\beta/[\alpha + \beta + \gamma])\cdot([wT + y]/w), \quad (14)$$

where the right-hand side is the optimal unconstrained leisure demand (L^*). Furthermore, solving for the optimal C and M, as expected it is easy to show that when $T < L^*$, C and M are higher than when $T \geq L^*$. Moreover, the inequality for L (14) implies that in the face of a health shock, the same factors that for an interior solution made a woman more likely to reduce labor supply (increase leisure demand) also make her more likely to locate at the boundary where $L = T$.

The analysis when the woman has her own health insurance, which disappears when she works less than H' (for example, when she becomes a part-time worker) is similar, although it introduces a discontinuity in the budget constraint at $T - H'$, making her more likely to reduce labor supply only to H' in the face of a health shock. Nonetheless, the main implications for labor supply are the same. In particular, the maximization problem is the same as before, except the budget constraint that holds depends on L. If $L < T - H'$, then

$$wT + y = wL + p_C C + p_M M(1-\tau(L)). \quad (15)$$

But if $T - H' \leq L$, the budget constraint is

$$wT + y = wL + p_C C + p_M M. \quad (16)$$

Note that we are assuming a simple static model, where all decisions are made and then transactions occur. So the woman cannot, for example, have health insurance and lower prices for M for part of the period.

If there is a tangency on the first budget constraint (15), then demands are the same as before, in particular

$$C^{*1} = (\alpha/[\alpha + \beta + \gamma])\cdot([wT + y]/p_C) \quad (17)$$

$$M^{*1} = (\gamma/[\alpha + \beta + \gamma])\cdot([wT + y]/p_M[1-\tau]) \text{ and} \quad (18)$$

$$L^{*1} = (\beta/[\alpha + \beta + \gamma])\cdot([wT + y]/w), \quad (19)$$

where the '$*^1$' superscript indicates that this is an interior optimum on the first piece of the budget constraint, with health insurance. If there is a tangency on the second budget constraint (16), then demands are

$$C^{*2} = (\alpha/[\alpha + \beta + \gamma])\cdot([wT + y]/p_C) \quad (20)$$

$$M^{*2} = (\gamma/[\alpha + \beta + \gamma])\cdot([wT + y]/p_M) \text{ and} \quad (21)$$

$$L^{*2} = (\beta/[\alpha + \beta + \gamma])\cdot([wT + y]/w). \quad (22)$$

Only the demand for M differs, and it is lower because the price of M is higher. This is a property of the Cobb-Douglas utility function, for which, at interior solutions, agents spend a fixed share of full income on each good. With a different utility function the demands for C and L could also change. Thus, for either of these two interior solutions, the implications of a health shock for labor supply (leisure demand) are the same.

For the boundary solution at $L = T$ the woman is on the lower budget constraint (16). As before, this is more likely when β is higher and/or w is lower, which are likely consequences of a health shock. Finally, we can have an optimum at the point where $L = T - H'$. Paralleling the earlier case, this occurs when at $L = T - H'$

$$L < (\beta/[\alpha + \beta + \gamma])\cdot([wT + y]/w) \quad (23)$$

and utility at this discontinuity is higher than at either the tangency on the lower budget constraint or the other boundary solution $L = T$. Thus, for a woman originally at a tangency on the higher budget constraint (15) (with L < T – H'), if a health shock makes a woman reduce her labor supply, there is likely to be some "bunching" at the discontinuity point where L = T – H'. The health shock can also push her to the point where L = T, depending on the parameters of the utility function and the wage. It could also, in principle, push her to a tangency on the lower budget constraint (16). But given the discontinuity in the budget constraint, there will clearly be a range of labor supply choices with L ≥ T – H' where utility is lower than at L = T – H'. Thus, again, there is no firm prediction that a health shock will reduce labor supply, although it seems likely. Moreover, when a woman has insurance through her own job rather than her spouse, the labor supply reduction will tend to be smaller, because for some women the optimum will occur at L = T – H' rather than at L > T – H'.

Our model clearly makes some simplifications. First, it does not consider choices regarding labor supply and investments in health in a dynamic environment, or joint decisions of husbands and wives regarding labor supply and health insurance coverage. Second, it does not consider the possibility that public health insurance may be an option for some women who lose coverage through their employer, possibly even creating an incentive for low-wage workers to reduce or cease labor supply if their employment-contingent health insurance policy is associated with high deductibles and co-payments, which increase p_M.

Third, our model does not apply to insurance arrangements where husbands can add a spouse who loses health insurance to his policy. The provisions of the Health Insurance Portability and Accountability Act (HIPAA) of 1996 require employers that offer health insurance to cover an employee who loses health insurance provided by an alternative source such as a spouse's policy. In addition, HIPAA allows employees to add a spouse or other dependents that lose job-related coverage to his or her insurance policy. But women with non-employed husbands or employed husbands without health insurance (or without health insurance that covers family members) would not benefit from HIPAA's provisions. In our sample of married women with breast cancer, 74 women have employment-contingent health insurance. Among the husbands of women with health insurance through their own employer, only

11 were insured through their employer, while 51 were covered exclusively through their wife's policy.[2] And among the 51 husbands insured through their wife's employment-contingent policy, only 40% worked for employers that offered health insurance. Thus, a relatively large share of women with employment-contingent health insurance would not have had the option of switching to their husband's policy under HIPAA. Under these circumstances, the predictions of the theoretical model should still hold, on average, for the sample, although they should be stronger for the subset of women who do not have the option of switching to their husband's policy under HIPAA. [3]

Finally, we ignore the option of purchasing health insurance if one loses employment-contingent insurance. A weaker assumption that would lead to similar qualitative conclusions is that health insurance obtained through the Consolidated Omnibus Reconciliation Budget Act (COBRA) is an inferior substitute (possibly considerably so) for health insurance offered by one's employer. In this case there is still an incentive to supply enough labor after a health shock to retain the employer's coverage, although for some women this incentive might be weakened. COBRA policies are often expensive and only last for 18 months following termination of employment. In addition, the job lock literature suggests that workers' concerns regarding the low probability that an equivalent health policy can be obtained limits their mobility and exit from the labor force—particularly when faced with a health shock (Stroupe et al., 2001). Thus, again, although some women who lose employment-contingent health insurance might be able to obtain insurance via COBRA, the qualitative conclusions of the model should still hold.

In the next section, we describe the data used to estimate the effects of health shocks on labor supply. In the case of breast cancer, the health shock should not disable the worker, but will require expensive medical treatment that may last 6 months or longer and will increase the risk of future medical costs and disability. The theory suggests that women are most likely to reduce labor supply in response to

[2] In addition, 8 were covered by their own and wife's employment-contingent policy (i.e., "double coverage"), 2 had "other" coverage (e.g., purchased plan), and 2 were uninsured.

[3] We do not know if the husband's insurance policy is equivalent to their wife's policy in terms of extent of covered services or cost. In addition, switching health insurance policies may also require that women change their health care providers.

a health shock, although less so when health insurance is contingent upon employment. Ultimately, though, this question must be examined empirically.

3. Data

Studying how a health shock alters labor supply when the employee is dependent on an employer for health insurance is difficult, because chronic diseases are less prevalent in the working-age population and few health shocks are amenable to prospective, longitudinal studies.[4] Cancer is an exception. Because the incidence and severity of disease is recorded in cancer registries, patients can be identified soon after diagnosis, contacted, and followed over time.

Previous research found that breast cancer and its treatment have a negative effect on women's labor supply 6 months following diagnosis (Bradley et al., 2005). Women with breast cancer were about 17 percentage points less likely to work relative to a control sample, and women with breast cancer who remained working worked fewer hours than women in the control group. In a cross-sectional study using the Health and Retirement Study, Bradley et al. (2002) found weak evidence that breast cancer survivors with health insurance through a spouse were less likely to be employed. Here, we move beyond the simple labor supply response to cancer, using longitudinal data to study differences in the labor supply response to a cancer health shock between married women who have employment-contingent health insurance and those who have health insurance through their spouse.

Women newly diagnosed with breast cancer were identified, shortly after diagnosis, from the Metropolitan Detroit Cancer Surveillance System (MDCSS), a population-based registry that covers over 4 million people within the Detroit Metropolitan area.[5] MDCSS is a participant in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program, and as such is held to high standards of completeness. Study eligibility criteria were age range of 30 to 64, English-speaking, and either employed or with an employed spouse at the time of diagnosis; 446 employed women were

[4] And studying self-reported disability and labor supply is plagued by endogeneity if self-reported disability is used to justify reduced labor supply (Hadley, 2003).
[5] Michigan does not have a state-sponsored short-term disability program that offers replacement wages, which can influence the time away from work. Such programs, if available, are through employers.

enrolled. The procedures for subject identification and recruitment are explained in Bradley et al. (in press).

The theoretical model developed in the previous section suggests that women are likely to reduce their labor supply following a health shock, but those with employment-contingent health insurance should reduce their labor supply to a lesser extent (or be less likely to do so) than women with an alternative source of insurance. Ideally, our sample would consist of women identical in all characteristics with the exception of insurance source. We attempted to obtain such a sample by selecting from the 446 women only those who were married and who were employed in the period just before diagnosis with cancer, and who were either insured through their own employer (n=74) or through their spouse's employer (n=126). Women insured through a purchased private policy, uninsured, or with coverage through their own and spouse's employer (i.e., "double coverage") were excluded from the sample in order to reduce heterogeneity introduced by different types of policies and self-selection into a particular insurance group. In contrast, we believe that women with coverage through their own employer or their spouse's employer are the most homogeneous with respect to both health (at the time of diagnosis) and socioeconomic status, so that studying these two insurance groups best isolates the effect of whether or not insurance is employment contingent.[6]

Part of the questionnaire we used to collect employment and insurance data was based on the Current Population Survey (CPS), using a similar order and following similar skip patterns.[7] There were three interviews covering four periods. The first occurred approximately 6 months after diagnosis, and included a retrospective set of questions on labor market participation 3 months prior to diagnosis (period 1) and a nearly identical set of questions on labor market participation as close as possible to 6 months after diagnosis (period 2).[8] The second and third interviews asked the same questions about labor market

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[6] The number of married women in these other categories of insurance was quite small (double coverage n=30; other private policy n=7; no insurance n=2). Insurance status (e.g., private insurance, Medicaid insurance, and uninsured) has been shown to be associated with the stage at which breast cancer is diagnosed (Bradley et al., 2001; Roetzheim et al., 1999; Ayanian et al., 1993).

[7] For details on the CPS, see U.S. Department of Labor and U.S. Department of Commerce (2002).

[8] The retrospective and 6 month questions were sometimes asked in two separate interviews, if the interviewee preferred to have a call back after answering the retrospective questions.

participation approximately 12 months (period 3) and 18 months (period 4) after diagnosis, as well as some additional questions.[9] The longitudinal structure of the interviews records when labor supply changes occurred relative to the breast cancer diagnosis documented in the cancer registry. The retrospective portion of the first interview required that breast cancer subjects recall their labor supply (employment and weekly hours) approximately 9 months prior to the interview; recall over a period of this length appears relatively reliable, although the literature indicates that there is some tendency for workers to overstate past hours (Duncan and Hill, 1985).

Our previous analyses of breast cancer and labor supply used a non-cancer control group constructed from the CPS. In studying employment effects of cancer, the non-cancer control group prevents confounding the effects of cancer with changes in labor market conditions over the course of the study, and with standard dynamics entailing some workers making the transition to non-employment. For some of our analyses in this paper, we follow the same strategy, constructing control groups from respondents to the CPS March supplement (which contains questions regarding health insurance) residing in Primary Metropolitan Statistical Areas (PMSAs) and Metropolitan Statistical Areas (MSAs) in the Great Lakes region.[10] One control group consists of CPS March supplement respondents in their 4th month ("month-in-sample" (MIS) 4) and MIS 5, which occurred 9 months apart, to be consistent with the 9-month span between the cancer subjects' pre- and post-diagnosis information. We extracted insurance information from MIS 1, 2, or 3 for a subset of respondents in MIS 4 whose March supplement questionnaire occurred prior to MIS 4. A second control group uses respondents' employment information from March MIS 1 through 4 matched to MIS 8. The resulting control sample represents a 15-month window for those in MIS 1 in March, a 14-month window for those in MIS 2, a 13-month window for those in MIS 3, and a 12-month window for those in MIS 4.[11] A corresponding control

[9] The questionnaire is available from the authors upon request.

[10] The Great Lakes region included Michigan, Indiana, Illinois, Ohio, the Buffalo MSA in New York, and MSAs in western Pennsylvania. A list of PMSAs and MSAs are available from the authors. We used a set of PMSAs and MSAs extending beyond Michigan to get a larger control group.

[11] In the CPS information on health insurance is available only in the March files. An alternative that better matches the 15-month time span covered between the retrospective and 12-month information in the cancer sample is to use only respondents in MIS 1 in March, and then observations in MIS 8 15 months later. However, in this case the

population was not available from the CPS for the 18-month cancer sample interview. We applied the same inclusion criteria to the CPS sample as to the cancer sample to achieve two control samples of 499 and 495 married, employed women with health insurance either through their employer or through their spouse's employer.

4. Empirical Specifications

The theoretical model developed in section 2 suggests that, when they experience a health shock, the labor supply responses of women who have health insurance through their employer are likely to differ from the responses of women with health insurance through their spouse. Yet these women experience similar health effects of cancer and its treatment. Thus, by stratifying the sample by whether the woman has employment-contingent health insurance (ECI=1) or insurance through her husband's employer (ECI=0), and studying the labor supply responses of each group to cancer and its treatment, we can estimate the effect of the source of health insurance on this labor supply response. Paralleling our earlier work, we first estimate models for the overall effects of cancer on employment and weekly hours worked. We then turn to the question of how employment-contingent health insurance conditions this response. We can also estimate models for the cancer sample only, dropping the control groups, to estimate the difference in labor supply response among women with similar health shocks but different sources of health insurance (but not the overall labor supply response).

The study outcomes are employment and weekly hours worked following diagnosis, or at subsequent periods in the CPS (MIS 5 and MIS 8). These outcomes are modeled as functions of control variables (X), breast cancer, source of health insurance, and unobserved influences (ε). We estimate the probability of employment (E) 6 and 12 months following diagnosis or at MIS 5 (period 2) or MIS 8 (period 3) for women employed as of period 1, which corresponds to 3 months prior to diagnosis for the cancer sample, using

$$\Pr(E_{ij}=1 | BC_i, ECI_{i1}=1, E_{i1}=1, X_i), \text{ and} \quad (24)$$

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control sample would be only one-fourth as large. Nonetheless, we verified that the "12-month" results were not sensitive to this alternative approach. In general, the match rate for observations on the sample individuals across different MISs was approximately 80%.

$Pr(E_{ij}=1 | BC_i, ECI_{i1}=0, E_{i1}=1, X_i), j > 1,$ (25)

where BC_i is a dummy variable for breast cancer. The 'i' subscript denotes individuals, and the 'j' subscript denotes periods. These equations describe the framework for the analysis with the control groups included. They are estimated as linear probability models, and the key question is how the estimated effect of breast cancer on labor supply differs across the two insurance groups.[12]

In the analysis without the control groups, $BC_i = 1$ for the whole sample and we estimate a single model

$Pr(E_{ij}=1 | ECI_{i1}, E_{i1}=1, X_i), j > 1, BC_i = 1.$ (26)

We estimate these equations as linear probability models that correspond to 6, 12, and 18 months following diagnosis. In this case, the key coefficient is that of the dummy variable indicating whether or not health insurance is contingent on employment. The 6-month period reflects a time when the health shock is likely to be most acute and the effects of treatment will be lingering for women receiving chemotherapy.[13] The 12- and 18-month periods reflect a time when most treatments are complete and the ill effects, except for those women with recurrent disease, should be minimized.

In some analyses breast cancer will be specified categorically to represent *in situ*, local, regional, and distant stages. These four stages are summary stages indicating progression in metastases. When we do these analyses including the control groups, everything is the same as in equations (24) and (25), except that BC_i is a vector of dummy variables for cancer stage. We also do the second analysis, omitting the control groups, distinguishing by stage of cancer. In this case the model is expanded to include interactions between the dummy variable for employment-contingent health insurance and dummy variables for cancer stage, and the key question is whether the labor supply response to employment-contingent health insurance varies with stage.

[12] We have also estimated all of the employment equations reported in this paper as probit models with the estimates translated into derivatives of the probability of working with respect to the independent variables. The results were nearly identical to those obtained using the linear probability models.

[13] All women with breast cancer received treatment. The majority of the women received surgery followed by chemotherapy and radiation. However, those with more advanced stages were more likely to have a mastectomy instead of a lumpectomy.

We assume that the same variables that affect employment also affect weekly hours worked (H), and estimate two different types of models for percent changes in hours—one that conditions on employment post-diagnosis, and one that does not. Other than that, the hours models are the same as the employment models. It is possible that the most dedicated workers remain at work regardless of their cancer diagnosis, whereas those who already tended to work less are more likely to reduce their hours. This is the reason for studying changes in hours from the pre-diagnosis to the post-diagnosis period, netting out the fixed unobservables that may be associated with pre- and post-diagnosis hours of work. These models are estimated for percent changes in hours using ordinary least squares regression.

Control Variables

In all estimations, we control for individual characteristics including age, education (no college degree, college degree or higher), number of children under age 18, household income, and weekly wages. Age is specified as a continuous variable. We include variables for household income in the year prior to diagnosis (or the corresponding year for the control sample). The maximum household income category recorded in the interview was $75,000. Household income was categorized as household income greater than or equal to $75,000 or household income less than $75,000. Weekly wages in the first period, which were calculated from women's report of hourly wages and typical hours worked per week, were also included in the estimations for 6 months following diagnosis (period 2).[14,15] In the equations for changes in weekly hours worked, we also control for weekly hours worked in the first period.

Selection by Health Insurance Source

We cannot ignore the possibility that women with employment-contingent health insurance are more career-oriented than other women, which may be the reason they have chosen to rely on their own

[14] In some estimations, we controlled for spouse characteristics such as age, education, race, health status, and union membership. The results were qualitatively similar when these variables were included (results not shown).

[15] We did not include controls for baseline wages and weekly hours worked in prior papers (Bradley et al., 2005; Bradley et al., 2002). The addition of baseline weekly hours worked to the estimations resulted in only slightly more moderate estimates of the effect of breast cancer. Including the wage had no effect on the coefficients for breast cancer. We are unable to include this control for the 12-month analysis because the baseline observations for the control group can also come from MIS 1-3, for which wages are not reported.

job for health insurance. In this case, these women might be more likely to work following a breast cancer diagnosis regardless of their health insurance source. Alternatively, jobs where health insurance is offered may be more desirable than jobs where health insurance is not offered. If so, then again we might observe that women who have employment-contingent health insurance are less likely to reduce employment or hours, but this may not be attributable to the economic incentives associated with this source of health insurance.

To partially address unobservable differences in the importance women place on their jobs—which could reflect commitment or job quality—we assessed women's degree of job involvement using questions developed by Lodahl and Kejner (1965) that were included in our survey. In particular, women were asked if they strongly agreed, agreed, disagreed, or strongly disagreed with five statements regarding their attitudes toward their jobs that reflect both commitment and the quality of the job. We tested whether women's responses to the job involvement questionnaire were independent of their source of health insurance, and could not reject independence for any of the five questions; the questions and these results are reported in Table 1.

In addition, we estimated models of responses to the job involvement questions using ordered probit models with the same control variables as used in the labor supply models plus employment-contingent insurance as an independent variable (results not shown). The coefficient for employment-contingent insurance was not statistically significant in any of the five models, again indicating no differences in responses based on the source of health insurance. We therefore are reasonably comfortable in assuming that different labor supply responses based on source of health insurance are not attributable to selection into different insurance groups based on job commitment or job quality. We also reiterate the earlier point that for hours we can control for fixed individual or job characteristics (assuming the job did not change) by studying changes in hours from pre- to post-diagnosis. Finally, the inclusion of controls for initial wages and hours should help mitigate this selection problem.

5. Results

Columns 1 through 3 of Table 2 compare the cancer sample to the CPS samples. The majority of women with breast cancer was diagnosed with early stage disease (*in situ* or local) and was more likely to have health insurance through their spouse's employer. Relative to women in the CPS, women with breast cancer were older, more educated, had fewer young children, had higher weekly wages, and had higher household income. Turning to labor supply, women with breast cancer were less likely to be employed following diagnosis and reduced their weekly hours worked from period 1 to subsequent time periods. Considerably smaller decreases in labor supply were observed from women in the CPS control sample; given that we condition on initial employment, some decreases for the control groups are expected as part of the ordinary dynamics of labor market entry and exit.

When we stratify the sample by health insurance source (columns 4 and 5 and columns 6 and 7), women with employment-contingent health insurance were a year older, had fewer children under age 18, and had slightly lower household incomes. Women with employment-contingent health insurance were more likely to be working in periods 2 through 4 and to work more hours at all subsequent time periods relative to women who had health insurance through their spouses.[16] A higher percentage of women with employment-contingent health insurance were diagnosed with earlier stage cancers relative to women with insurance through their spouse, but this difference was only marginally statistically significant (p=.11).

Employment

The first two columns of the top panel of Table 3 replicate findings from our prior research (Bradley et al., 2005). Breast cancer has a negative and statistically significant effect on the probability of working 6 months following diagnosis (column 1). Breast cancer *in situ* does not have a statistically significant effect on employment, but regional and distant stage cancer have negative and statistically significant effects (column 2). Turning to the effects of health insurance (columns 3 through 6), although at 6 months following diagnosis the effects of treatment are still likely to be present, especially for more

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[16] The figures for period 4 (or 18 months) come only from the breast cancer sample.

advanced cancers, breast cancer only marginally statistically significantly (-.08, p=.07) reduces the probability of employment of women whose health insurance is through their employer (column 3). In contrast, women with breast cancer and who had health insurance through a spouse were twice as likely to become non-employed (column 5). In column 4, for those with employment-contingent health insurance, a statistically significant effect was not observed for women with cancer at any stage, but stronger and significant negative effects were observed for women with local or regional cancer when insurance was through the spouse. Apparently breast cancer's negative effect on employment, reported in columns 1 and 2, is disproportionately attributable to women with health insurance through a spouse.

The bottom panel turns to employment differences 12 months following diagnosis. Overall, breast cancer does not appear to have a statistically significant effect on the probability of employment 12 months following diagnosis for women with the exception of a marginally significant positive effect for women with in situ cancer (Table 3, lower panel, columns 1 and 2). In estimations where we stratify by health insurance source, the coefficients are actually positive and statistically significant for women with regional and distant stage cancers for women with employment-contingent health insurance (column 4). In contrast, similar estimations for women with health insurance through a spouse find negative effects of invasive cancers on employment, although only the coefficient for regional stage disease is statistically significantly ($p<.05$). Women with in situ cancers who are insured through their spouse have a statistically significant ($p<.01$) higher probability of employment (11 percentage points) relative to their non-cancer controls (column 6).

Table 4 reports differences in the likelihood of employment 6, 12, and 18 months following diagnosis for women with breast cancer. For this analysis, we do not use control groups. This lets us focus most sharply on the difference in the employment response associated with employment-contingent health insurance; the downside is it does not let us estimate the overall labor supply response for the two groups of women distinguished by source of health insurance. At 6 and 18 months following diagnosis, women with employment-contingent health insurance are significantly more likely to be employed relative to women with insurance through their employer (columns 1 and 5). Columns 2, 4, and 6 contain interaction terms between employment-contingent insurance and cancer stage. By and large, we observe that employment-contingent health insurance reduces the likelihood that cancer is associated with lowered employment, especially 12 months post-diagnosis. That is, employment-contingent health insurance moderates (perhaps considerably) the labor supply reduction that occurs in response to breast cancer.

Table 5 reports findings from a specification that examines whether the difference in labor supply response for those with employment-contingent health insurance is larger for women who do not have the option of switching to their husband's insurance policy, as would be allowed under HIPAA provisions. Theory would suggest this result; and if we found the opposite—with a bigger difference in labor supply response for those *with* the option of switching to their husband's insurance—then we would have to be skeptical that our results are driven by the incentives to remain at work created by employment-contingent insurance. Specifically, the specification allows a different response to the health shock for those women with employment-contingent health insurance when the husband does not have insurance, either because he is non-employed or his employer does not offer insurance.[17] As Table 5 shows, although the estimated difference in the labor supply response when the husband does not have insurance is not statistically significant, in all three columns the point estimates suggest that the difference in labor supply response is greater for women who do not have the option of switching to their husband's policy, relative to the labor supply response of women who may have the option of becoming covered by their husband's policy. This is further evidence that the differences in labor supply responses to health shocks associated with employment-contingent health insurance are in fact attributable to the incentives that this type of insurance creates.

Weekly Hours Worked

Table 6 reports the percent change in weekly hours worked, unconditional and conditional on employment 6 and 12 months following diagnosis (periods 2 and 3). The unconditional estimates reflect employment effects as well, whereas the conditional estimates isolate hours effects for those working in

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[17] We also include dummy variables for the main effects for these two different reasons the husband does not have health insurance.

both periods. Looking at the estimates 6 months after diagnosis, in the top two panels, columns 1 and 2 point to hours declines attributable to cancer, both conditionally and unconditionally. In columns 3 through 6, we explore how this labor supply response varies with the source of health insurance. The estimates indicate that women diagnosed with breast cancer who had health insurance through their spouse decreased weekly hours worked by considerably greater amounts than did women with health insurance through their own employer.

For example, as shown in the second panel of Table 6, columns 3 and 5, women with insurance through the spouse experienced a 25% reduction, compared to a 7% reduction in hours worked for women with employment-contingent health insurance, 6 months post-diagnosis. This effect may arise in part because the need to maintain employment-contingent health insurance deters shifts from full-time to part-time employment. Columns 4 and 6 report similar results distinguishing the effects by cancer stage. In general, the results often indicate that women with health insurance through their spouse reduce their hours by more than double the amount by which women with health insurance through their employer reduce their hours.[18]

The bottom two panels of Table 6 report findings from the analysis of weekly hours worked 12 months following diagnosis. Breast cancer does not appear to have statistically significant effects on weekly hours worked for women with employment-contingent health insurance. In contrast, women with breast cancer and health insurance through their spouse reduced their weekly hours worked sharply relative to women without breast cancer (columns 5 and 6). This finding is statistically significant ($p<.05$) for all stages.

Table 7 reports percent changes in weekly hours worked for women with breast cancer, without the non-cancer control groups, and expanding the analysis to 18 months. Women with employment-

[18] We also estimated these models pooling the data for the two insurance groups interacting all of the variables—including those for cancer—with a dummy variable for spouse insurance. The interaction term between cancer and spouse insurance was negative and statistically significant ($p<.05$, results not shown) for all of the hours specifications, indicating that the coefficients shown in Table 6 by source of health insurance are statistically significantly different from each other. This was not always the case for the corresponding employment estimates from Table 3.

contingent health insurance reduced their weekly hours worked by less than women with health insurance through their spouse. For example, in the lower panel of Table 7, column 1—which conditions on employment in the post-diagnosis period—women with employment-contingent health insurance, on average, reduce their weekly hours by 9% less than women with health insurance through their spouse, 6 months after diagnosis. By 12 months the difference is no longer significant. However, the unconditional hours changes, which also incorporate employment changes, indicate significant smaller labor supply reductions for those with employment-contingent insurance in all three post-diagnosis periods.

Looking at the specifications distinguishing the effects by stage, there is clearly some indication that these labor supply responses differ more for those with more advanced-stage cancers. Women with employment-contingent health insurance are less likely to reduce their labor supply in response to the adverse health shock represented by breast cancer, and this is more pronounced for advanced cancers.

6. Conclusions and Discussion

Our empirical analysis of health, health insurance, and labor supply leads to a relatively clear finding that a negative health shock, as reflected in a diagnosis of breast cancer, decreases labor supply to a greater extent among women insured by their spouse's policy than among women with health insurance through their employer. Put the other way round, it is often difficult to detect much if any labor supply response to breast cancer among women whose health insurance is contingent upon their own employment. Moreover, the difference in responses associated with source of health insurance is greater for women with advanced-stage diseases—suggesting that even women who required aggressive treatment were sensitive to employment-contingent insurance in making their labor supply decisions in the post-diagnosis period of treatment and recovery.

We consider the possibility that selection bias with respect to source of health insurance biases our estimates. This bias could arise if women with employment-contingent health insurance are more dedicated to their jobs or have more desirable jobs, and thus are more likely to work even when they are sick. To address this concern, we asked women a series of questions about their job and assessing their job involvement. We did not observe statistically significant differences in responses by health insurance source. In addition, the evidence based on longitudinal changes in hours, and the inclusion of controls for initial wages and hours, provide additional confidence in a causal interpretation of the findings rather than one attributable solely to selection, although we cannot decisively rule out all possible explanations of our results based on selectivity with respect to source of health insurance.

Employment-contingent insurance appears to be an incentive to remain working and to work at a greater intensity (as defined by weekly hours worked) when faced with an adverse health shock. The health and productivity implications of this apparent consequence of employment-contingent insurance are yet to be measured. For example, it is possible that women with health insurance through their employer reduce their treatment by eliminating doses of radiation or courses of chemotherapy in order to maintain their labor supply. Anecdotally, a few women spontaneously confided to the study interviewers that they quit their treatment because it interfered with their jobs. Such trade-offs between health and work may set the stage for recurrent disease in the future. At least one study has shown that among unhealthy men, those who do not take sick leave are at higher risk for future coronary events relative to unhealthy men who take sick leave (Kivimaki et al., 2005). We speculate that low-income workers are most likely to quit treatment in order to keep their jobs because their employers may offer little sick leave and workplace accommodation (e.g., rest breaks, reduced work schedule, reassignment of physical tasks) that would make balancing health and work demands possible. A decision to continue working may contribute to future survival disparities in breast cancer between lower and upper socioeconomic status women (Baquet and Commiskey, 2000). Alternatively, women who have health insurance through their employer may be more efficient with their recovery time,[19] whereas women with health insurance, even if their health status and health care needs are similar, choose more extended time away from work.

Building on these two interpretations—that women sacrifice health, in the form of optimal treatment and recovery, to maintain jobs with health insurance, or that women reliant upon their jobs for health insurance become efficient in recovery time—we consider the policy implications of the findings. First, if workers are constrained in their ability to recover following a health shock because insurance is

[19]To some extent, this may be possible if women seek aggressive symptom management.

contingent on employment, then policies are needed to assist them. Existing policies such as Federal Medical Leave Act (FMLA), COBRA, and HIPAA laws may be inadequate for women trying to balance health care and work. The purpose of FMLA was to ensure job retention for families struggling with illness and COBRA's intent was to lessen financial vulnerability for health care costs that may occur when individuals are between jobs. Neither of these policies fully addresses how to help ill workers who require that health insurance coverage be maintained, but may be unable to work for an extended period of time. HIPAA allows an employee to add a spouse or other dependents that lose job-related coverage to his or her insurance policy. However, many women with breast cancer who have employment-contingent insurance through their own employer do not have the option of switching to an employed spouse's policy. In particular, HIPAA's provisions offer no benefit to the most vulnerable working women (e.g., those with a non-employed spouse or those with an employed spouse whose employer does not offer health insurance). If the absence of labor supply reductions for those with employment-contingent health insurance is associated with health care sacrifices in the short-term, then employment-contingent health insurance may lead to higher costs for individuals, their families, and society in the long-run.

Alternatively, if employment-contingent health insurance encourages employees to be more efficient with their recovery time after experiencing a health shock, then employment-contingent health insurance offers an unexpected benefit to employers by increasing employee retention and reducing absenteeism. From this perspective, it may be unfortunate that national trends indicate a declining number of workers insured through the workplace (Kaiser Family Foundation, 2004; Blumberg and Holahan, 2004; Holahan and Wang, 2004).

To our knowledge, this is the first study to prospectively and longitudinally examine the labor supply response of individuals experiencing a health shock and whether this response is dependent on source of health insurance. The findings underscore the labor supply incentives posed by employment-contingent health insurance, and hint at potential benefits to employers by creating an incentive for employees to remain working after a health shock. However, the health toll on individuals who remain working because of the incentives posed by employment-contingent health insurance, which could potentially undermine any short-term beneficial effects to employers, is unknown.

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Table 1. Comparison of job involvement responses by insurance source

Question	Response category	Employment-contingent insurance N=69	Spouse insurance N=122	p-value
"The major satisfaction in my life comes from my job"	Strongly agree	13.04%	9.02%	
	Agree	47.83%	36.07%	
	Disagree	30.43%	40.98%	
	Strongly disagree	8.70%	13.93%	0.21
"The most important things that happen to me involve my work"	Strongly agree	7.25%	3.28%	
	Agree	27.54%	25.41%	
	Disagree	53.62%	59.84%	
	Strongly disagree	6.35%	11.48%	0.61
"I'm really a perfectionist about my work"	Strongly agree	33.33%	33.61%	
	Agree	52.17%	54.92%	
	Disagree	11.59%	10.66%	
	Strongly disagree	2.90%	0.00%	0.31
"I live, eat, and breathe my job"	Strongly agree	2.90%	1.64%	
	Agree	14.49%	12.30%	
	Disagree	50.72%	49.18%	
	Strongly disagree	31.88%	36.07%	0.87
"I am very much involved personally in my work"	Strongly agree	28.98%	27.87%	
	Agree	60.87%	52.46%	
	Disagree	10.14%	18.85%	
	Strongly disagree	0.00%	0.82%	0.35

Notes: Responses were missing for 5 subjects with health insurance through their own employer and for 4 subjects with health insurance through their spouse. p-values are from χ^2 tests of independence.

Table 2. Descriptive statistics for cancer and control samples

				Samples used for 6 month/period 2 analysis		Samples used for 12 month/period 3 analysis	
	(1) Breast cancer (n=200)	(2) MIS 4 to 5 (n=494)	(3) MIS 1-4 to 8 (n=495)	(4) Own employer insurance (n=322)	(5) Spouse insurance (n=372)	(6) Own employer insurance (n= 323)	(7) Spouse insurance (n= 372)
Breast cancer				n=74	n=126	n=74	n=126
In situ	29.50%	N/A	N/A	36.49%	25.40%	36.49%	25.40%
Local	44.00%	N/A	N/A	43.24%	44.44%	43.24%	44.44%
Regional	24.00%	N/A	N/A	16.22%	28.57%	16.22%	28.57%
Distant/Unknown	2.50%	N/A	N/A	4.05%	1.59%	4.05%	1.59%
Health insurance							
Own employer	37.00%	50.20%***	50.30%***	N/A	N/A	N/A	N/A
Spouse employer	63.00%	49.80%***	49.70%***	N/A	N/A	N/A	N/A
Mean age	49.83 (7.19)	45.52 (7.43)***	45.86 (7.59)***	47.33 (7.82)*	46.27 (7.40)	47.81 (7.81)***	46.30 (7.52)
Race/ethnicity							
White, Hispanic, non-black	82.50%	91.09%***	90.10%	86.96%	90.05%	86.69%	88.98%
African-American, non-Hispanic	17.50%	8.91%***	9.90%	13.04%	9.95%	13.31%	11.02%
Education							
No high school diploma	3.00%	4.05%**	4.65%**	3.73%	3.76%	3.10%	5.11%
High school diploma	25.00%	35.22%**	35.76%**	29.81%	34.41%	31.58%	33.60%
Some college	29.00%	25.91%**	25.86%**	26.09%	27.42%	25.70%	27.69%
College degree	43.00%	34.82%**	33.74%**	40.37%	34.41%	39.63%	33.60%
Number of children < 18	0.65 (0.94)	0.96 (1.04)***	0.87 (1.04)***	0.76 (0.98)***	0.97 (1.05)	0.72 (0.98)***	0.99 (1.08)
Mean weekly wages	$866.37 ($1128.48)	$615.66 ($418.03)***	$644.87 ($489.71)**	$809.44*** ($619.09)	$577.21 ($767.81)	$650.60*** ($993.32)	$929.30 ($799.22)
Household income							
≤$20,000	1.56%	1.59%**	1.82%***	2.42%	0.87%	2.44%	1.16%
$21,900 to $74,900	35.42%	46.26%**	48.86%***	45.67%	40.70%	47.74%	42.32%
≥$75,000	63.02%	52.15%**	49.32%***	51.90%	58.43%	49.83%	56.52%

Employment characteristics							
Employed at 6 months	81.50%	93.72%***	N/A	93.17%**	87.63%	N/A	N/A
Employed at 12 months	88.02%	N/A	92.53%*	N/A	N/A	92.77%	89.97%
Employed at 18 months	86.91%	N/A	N/A	N/A	N/A	N/A	N/A
Weekly hours worked							
Pre-diagnosis/period 1	36.54 (12.30)	36.56 (11.11)	36.01 (11.67)	40.12 (8.23)***	33.47 (12.88)	39.55 (8.83)***	33.22 (13.28)
6 months/period 2	26.33 (16.74)	34.79 (13.48)***	N/A	36.61 (13.14)***	28.67 (15.50)	N/A	N/A
12 months/period 3	29.60 (16.05)	N/A	33.79 (14.03)***	N/A	N/A	36.21 (13.03)***	29.43 (15.44)
18 months/period 4	30.43 (16.24)	N/A	N/A	N/A	N/A	N/A	N/A

Notes: Column (1) is compared to columns (2) and (3), column (4) is compared to column (5), and column (6) is compared to column (7) for statistical testing using the χ^2 test for categorical variables and two-sample t-test for continuous variables. Standard deviations of continuous variables are shown in parentheses. In a few cases, sample sizes are smaller than indicated in the column headings due to missing wage and income data. Finally, 8 women with breast cancer dropped out the study after the 2nd period (6 months) and 1 additional woman dropped out after the 3rd period (12 months); the primary reason for dropping out of the study was "too sick" to continue. *Statistically significant difference p<.10, **p<.05, ***p<.01.

Table 3. Comparison of the probability of employment 6 and 12 months following diagnosis/MIS 5/MIS 8

6 months following diagnosis/MIS 5	**Pooled sample (n=590)**	**Pooled sample (n=590)**	**Own employer insurance (n=276)**		**Spouse employer insurance (n=314)**	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Breast cancer	-0.14 (0.03)***	N/A	-0.08 (0.04)*	N/A	-0.16 (0.05)***	N/A
In situ	N/A	0.01 (0.03)	N/A	-0.01(0.04)	N/A	-0.03 (0.05)
Local	N/A	-0.11 (0.04)**	N/A	-0.07 (0.07)	N/A	-0.12 (0.06)**
Regional	N/A	-0.33 (0.07)***	N/A	-0.23 (0.13)	N/A	-0.36 (0.09)***
Distant/unknown stage	N/A	-0.33 (0.22)	N/A	-0.27 (0.27)	N/A	-0.44 (0.37)
Age	0.001 (0.002)	-0.00 (0.002)	0.001 (0.003)	0.001 (0.003)	-0.001 (0.004)	-0.002 (0.004)
African-American	-0.07 (0.05)	-0.06 (0.04)	-0.09 (0.06)	-0.07 (0.06)	-0.06 (0.07)	-0.05 (0.07)
College graduate	0.03 (0.03)	0.03 (0.03)	0.08 (0.04)**	0.08 (0.04)**	-0.01 (0.04)	-0.01 (0.04)
Number of children <18	0.004 (0.02)	0.002 (0.01)	0.01 (0.01)	0.01 (0.01)	0.001 (0.03)	-0.002 (0.03)
Household income ≥$75,000	0.003 (0.03)	0.01 (0.03)	-0.02 (0.03)	-0.02 (0.03)	0.04 (0.04)	0.04 (0.04)
Weekly earnings	0.002 (0.001)	0.001 (0.001)	0.002 (0.002)	0.001 (0.001)	0.001 (0.002)	0.000 (0.002)
12 months following diagnosis/MIS 8	**Pooled sample (n=624)**	**Pooled sample (n=624)**	**Own employer insurance (n=282)**		**Spouse employer insurance (n=342)**	
Breast cancer	-0.03 (0.03)	N/A	0.01 (0.04)	N/A	-0.04 (0.04)	N/A
In situ	N/A	0.06 (0.03)*	N/A	0.03 (0.05)	N/A	0.11 (0.03)***
Local	N/A	-0.04 (0.04)	N/A	-0.04 (0.07)	N/A	-0.03 (0.05)
Regional	N/A	-0.10 (0.06)	N/A	0.13 (0.04)***	N/A	-0.14 (0.08)*
Distant/unknown stage	N/A	-0.16 (0.22)	N/A	0.09 (0.03)**	N/A	-0.38 (0.36)
Age	-0.004 (0.002)*	-0.004 (0.002)*	-0.01 (0.003)**	-0.01 (0.003)**	-0.001 (0.003)	-0.002 (0.003)
African-American	-0.03 (0.04)	-0.02 (0.04)	-0.09 (0.06)	-0.09 (0.06)	0.03 (0.05)	-0.03 (0.05)
College graduate	0.01 (0.01)	0.01(0.02)	0.000 (0.03)	-0.002 (0.03)	0.02 (0.04)	0.01 (0.04)
Number of children <18	0.02 (0.03)	0.01 (0.01)	0.004 (0.02)	-0.01 (0.02)	0.02 (0.02)	0.02 (0.02)
Household income ≥$75,000	0.02 (0.03)	0.03 (0.03)	0.04 (0.03)	0.04 (0.03)	0.02 (0.04)	0.02 (0.04)

Notes: White standard errors are in parentheses. Omitted categories are non-cancer, white/other, no college education, and household income less than $75,000. *Statistically significant p<.10, **p<.05, *** p<.01.

Table 4. Linear probability models predicting employment 6, 12, and 18 months following diagnosis, married women with breast cancer

Independent variables	**6 months (n=180)**		**12 months (n=172)**		**18 months (n=171)**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Employment-contingent health insurance	0.13 (0.06)**	-0.01 (0.07)	0.05 (0.05)	-0.09 (0.05)	0.11 (0.05)**	-0.18 (0.08)
Local	N/A	-0.17 (0.08)**	N/A	-0.15 (0.06)***	N/A	-0.14 (0.09)
Regional	N/A	-0.39 (0.10)***	N/A	-0.23 (0.08)***	N/A	-0.16 (0.10)
Distant/unknown	N/A	-0.47 (0.37)	N/A	-0.50 (0.37)	N/A	-0.37 (0.10)
Local × Employment-contingent health insurance	N/A	0.13 (0.12)	N/A	0.09 (0.10)	N/A	0.15 (0.12)
Regional × Employment-contingent health insurance	N/A	0.18 (0.17)	N/A	0.33 (0.10)***	N/A	0.25 (0.12)**
Distant × Employment-contingent health insurance	N/A	0.30 (0.45)	N/A	0.64 (0.38)*	N/A	0.40 (0.38)

Notes: White standard errors are in parentheses. Other covariates included but not reported are the same as in Table 3. Omitted categories are in situ cancer (columns 2, 4, and 6), spouse insurance, white/other, no college education, and household income less than $75,000. *Statistically significant p<.10, **p<.05, *** p<.01.

Table 5. Linear probability models predicting employment 6, 12, and 18 months following diagnosis, controlling for the option of switching to husband's policy, married women with breast cancer

Independent variables	6 months (n=180)	12 months (n=172)	18 months (n=171)
	(1)	(2)	(3)
Employment-contingent health insurance	0.14 (0.07)**	0.02 (0.08)	0.09 (0.07)
Employment-contingent health insurance × husband without employer health insurance	0.08 (0.17)	0.13 (0.13)	0.04 (0.11)
Husband's employer does not offer insurance	-0.17 (0.17)	-0.13 (0.13)	-0.02 (0.11)
Husband non-employed	-0.08 (0.14)	0.04 (0.11)	0.10 (0.10)

Notes: White standard errors are in parentheses. Other covariates included but not reported are the same as in Table 3. Omitted categories are in situ cancer (columns 2, 4, and 6), spouse insurance, white/other, no college education, and household income less than $75,000.
**Statistically significant p<.05.

Table 6. Percent change in weekly hours worked 6 and 12 months following diagnosis/MIS 5/MIS 8

	Pooled sample (n=590)		Own employer insurance (n=276)		Spouse employer insurance (n=314)	
Unconditional on employment 6 months following diagnosis/MIS 5	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Breast cancer	-28.16*** (4.38)	N/A	-14.36 (4.88)***	N/A	-36.34 (6.75)***	N/A
In situ	N/A	-9.95* (5.13)	N/A	-4.28 (5.60)	N/A	-17.95 (9.00)**
Local	N/A	-22.80*** (5.28)	N/A	-13.51 (7.00)*	N/A	-26.54 (7.54)***
Regional	N/A	-54.92*** (7.85)	N/A	-32.64 (13.42)**	N/A	-62.39 (9.66)***
Distant/unknown stage	N/A	-54.45** (21.20)	N/A	-44.50 (24.20)*	N/A	-81.45 (39.79)*
Conditional on employment 6 months following diagnosis/MIS 5	**(n=534)**		**(n=258)**		**(n=276)**	
Breast cancer	-17.54 (3.50)***	N/A	-7.12 (2.90)**	N/A	-25.31 (6.03)***	N/A
In situ	N/A	-11.95 (4.54)***	N/A	-3.68 (4.30)	N/A	-22.26 (8.68)**
Local	N/A	-15.00 (4.21)***	N/A	-7.13 (2.66)***	N/A	-20.36 (7.20)***
Regional	N/A	-31.71 (6.33)***	N/A	-13.43 (9.53)	N/A	-38.98 (7.93)***
Distant/unknown stage	N/A	-27.39 (13.61)**	N/A	-25.05 (19.50)	N/A	-42.60 (13.83)***
Unconditional on employment 12 months following diagnosis/MIS 8	**(n=587)**		**(n=269)**		**(n=318)**	
Breast cancer	-11.76 (4.24)***	N/A	-2.18 (5.46)	N/A	-15.70 (6.01)***	N/A
In situ	N/A	4.75 (7.23)	N/A	3.69 (5.31)	N/A	9.31 (13.60)
Local	N/A	-12.58 (4.81)***	N/A	-10.26 (8.54)	N/A	-12.90 (6.22)**
Regional	N/A	-26.36 (7.18)***	N/A	7.95 (8.24)	N/A	-34.00 (8.40)***
Distant/unknown stage	N/A	-56.76 (41.07)	N/A	2.00 (4.47)	N/A	-114.10 (10.23)***
Conditional on employment 12 months following diagnosis/MIS 8	**(n=533)**		**(n=249)**		**(n=284)**	
Breast cancer	-11.45 (3.55)***	N/A	-2.18 (5.46)	N/A	-16.20 (5.25)***	N/A
In situ	N/A	-3.08 (6.68)	N/A	3.69 (5.31)	N/A	-5.22 (12.77)
Local	N/A	-11.67 (3.81)***	N/A	-10.26 (8.54)	N/A	-14.34 (5.19)***
Regional	N/A	-22.07 (6.00)***	N/A	7.95 (8.24)	N/A	-29.24 (7.52)***
Distant/unknown stage	N/A	-7.88 (2.76)***	N/A	2.00 (4.47)	N/A	N/A

Notes: The percent hours changed is defined as either ((6-month or 12-month reported weekly hours worked minus baseline weekly hours worked) ÷ baseline hours worked) × 100. White's standard errors are in parentheses. Other covariates included but not reported are the same as in Table 3 with the addition of hours worked at period 1. Omitted categories are non-cancer, white/other, no college education, and household income less than $75,000. *Statistically significant p<.10, **p<.05, *** p<.01.

Table 7. Percent change in weekly hours worked 6, 12, and 18 months following diagnosis by insurance source, married women with breast cancer, conditional and unconditional models

Independent variables	6 months (n=180)		12 months (n=164)		18 months (n=167)	
	(1)	(2)	(3)	(4)	(5)	(6)
Unconditional on employment in follow-up period						
Employment-contingent health insurance	18.26 (6.67)***	10.56 (9.69)	13.00 (6.64)**	5.19 (8.84)	16.43 (7.05)**	19.30 (10.86)*
Local	N/A	-9.54 (9.99)	N/A	-10.30 (9.11)	N/A	-5.46 (12.98)
Regional	N/A	-43.40 (10.59)***	N/A	-31.53 (10.82)***	N/A	-13.99 (12.49)
Distant/unknown	N/A	-46.14 (39.30)	N/A	-111.34 (12.58)***	N/A	-114.17 (12.76)***
Local × Employment-contingent health insurance	N/A	0.58 (13.67)	N/A	-7.36 (13.60)	N/A	-15.06 (15.40)
Regional × Employment-contingent health insurance	N/A	16.92 (17.73)	N/A	38.82 (14.37)***	N/A	18.41 (15.07)
Distant × Employment-contingent health insurance	N/A	15.72 (45.58)	N/A	111.34 (12.58)***	N/A	88.90 (26.86)***
Conditional on employment in follow-up period	**(n=147)**		**(n=144)**		**(n=146)**	
Employment-contingent health insurance	9.04 (4.43)**	11.44 (8.00)	6.74 (5.05)	9.77 (7.95)	6.67 (4.53)	20.15 (8.60)**
Local	N/A	6.24 (7.18)	N/A	-3.69 (7.58)	N/A	21.41 (11.50)*
Regional	N/A	-17.35 (9.09)*	N/A	-10.37 (9.30)	N/A	1.50 (9.74)
Distant/unknown	N/A	2.64 (8.61)	N/A	-7.11 (3.18)**	N/A	-25.75 (16.66)
Local × Employment-contingent health insurance	N/A	-10.52 (9.35)	N/A	-14.16 (10.43)	N/A	-27.00 (12.08)**
Regional × Employment-contingent health insurance	N/A	8.95 (14.10)	N/A	10.43 (12.47)	N/A	-3.58 (12.49)
Distant × Employment-contingent health insurance	N/A	-20.56 (19.68)	N/A	N/A	N/A	N/A

Notes: The percent hours changed is defined as either ((6-month or 12-month reported weekly hours worked minus baseline weekly hours worked) ÷ baseline hours worked) × 100. Other covariates included but not reported are the same as in Table 3. Omitted categories are *in situ* cancer (columns 2, 4, and 6), spouse insurance, white/other, no college education, and household income less than $75,000. *Statistically significant p<.10, **p<.05, ***p<.01.