

HEALTH INSURANCE COST AND PREMIUM SHARING^{*}

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Abstract:

Employees may have heterogeneous preferences with respect to the level of health insurance coverage desired. Hence employers may offer multiple health insurance plans and use employee premium sharing to sort workers according to how they value health insurance. The benefits of sorting workers increase with the cost of health insurance. We use data from the “Employer Health Benefits Survey”, to analyze the effect of health insurance premiums on premium sharing for firms offering multiple plans, focusing on firms that offer HMO and PPO plans. We find that the worker’s contribution for family coverage increases as the premium rates increase. The contributions for single coverage increase as the own premium rate increases and decrease as the cross premium rate increases.

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1. Introduction

The cost of health insurance relative to payroll increased 34 percent between 1996 and 2005 (Eibner and Marquis, 2008). As health insurance costs continue to rise, researchers have paid greater attention to issues of access to insurance, particularly through employer sponsored plans. Most of this attention has focused on the extensive margin of health insurance access, i.e. whether firms make employer sponsored plans available to their employees. Significantly less attention has been paid to the intensive margins –how much of the cost of providing health insurance is paid for by firms or the average quality of these insurance plans. This paper focuses on the first of these intensive margins, specifically on the question of how the price of health insurance affects how firms offering multiple health insurance plans determine the worker’s contribution toward each plan.

Contemporaneously to the rise of health insurance costs, the percentage of firms that offered health benefits decreased from 69% to 60% from 2000 to 2007, although this drop seems to be driven primarily by firms employing less than 10 workers (Kaiser/HRET, 2008, Exhibit 2.2). In fact, the percentage of large firms (i.e. firms that employed more than 200 employees) that offered health insurance did not change at all during the same period. Large firms almost universally offer health benefits (99%), and this rate has remained unchanged over the same time period. This fact is supported by the conclusion in many studies that a firm’s decision to offer health insurance is price inelastic.¹ Although premium size does not seem to have an impact on large firms’ decision to offer health insurance at the extensive margin, it could be that they affect the employer’s decision at the intensive margin, i.e. the share of the cost that is passed onto workers. In fact, the percentage of firms paying for the entire premium of single coverage decreased dramatically from 32% in 2001 to 20% in 2007, and from 14% in 2001 to 6% in 2007

¹ See Table 1 in Marquis and Long (2001) for a summary of the results in the literature.

for family coverage (Kaiser/HRET, 2008, Exhibit 6.9). This is a new trend in the economy, as there is no evidence that before 2001 the percentage of firms that paid for the full price of the health insurance was sensitive to the price of the premium (Zawacki and Taylor, 2005). In light of this evidence, the question of how premium sharing between employees and employers responds to increases of health insurance premiums becomes a pressing one. In fact, Cutler (2003) shows that most of the recent decrease in employer sponsored health insurance coverage can be explained by a decrease in take-up rates by employees due to an increase in the cost to them rather than a decrease in offering rates by employers.

The issue of premium sharing is of particular importance for large firms, since they are the least likely to drop health insurance from their compensation package. Large firms are also more likely to offer multiple plans. In 2001, 56.7% of firms with more than 50 employees offered more than one plan in 2001, while only 12.5% of smaller firms offer multiple plans (Crimmel, 2003). Hence, the question of how the increase in the cost of health insurance affects premium sharing cannot disregard the fact that large firms offer multiple plans. This paper is the first to study the effect of health insurance premiums on cost sharing for firms offering multiple plans. The rest of the paper is organized as follow: next section reviews the literature on this topic. Section 3 describes the model and section 4 outlines the methodological strategies adopted for the estimation. Section 4 describes the data while the empirical results are discussed in Section 5. Finally we conclude with some final remarks on the main finding of this paper.

2. Literature review

Very little is known about the determinants of premium sharing, and even less about the role played by health insurance premiums. Marquis and Long (2001) estimate the level of

employer contribution to the health insurance premium as a function of current labor market conditions. Among other factors, they found that the employer's premium share is higher when the firm operates in tighter labor market condition, when there is greater union penetration and a greater share of workers are employed in big business. They do not control for insurance premiums, although they found that state income tax rates, which they believe to best capture price effects, do not have a significant impact on the employer's contribution.

Gruber and McKnight (2003) identify four determinants of premium sharing: the tax subsidies on the employer contribution, the availability of coverage outside the firm, the penetration of health care, and the size of the health insurance premium. However, since their data lacks information on both health insurance premiums and premium sharing, they can only estimate the effect that an increase in health care cost (a proxy for health insurance premium) has on the odds an employer will pay all/some/none of the premium. Consistent with their hypothesis, they found that when the cost of health care increases, the probability that an employer pays the entire insurance premium decreases: for each US\$1,000 increase in medical costs there is a 2.7% reduction in the probability that employers pay all of the cost of health insurance. They also found evidence that employers use premium sharing to encourage workers to obtain coverage through alternative forms of coverage. For example, as the proportion of employees eligible for Medicaid increases, the share of the premium passed on to workers is higher. This result has been confirmed by other studies (Shore-Sheppard et al., 2000; Buchmueller et al., 2005). Along the same line, Dranove et al. (2000) and Vistnes et al. (2006) found that employers raise employee contributions to encourage them to obtain coverage from their spouses' employers. Both Dranove et al (2000) and Vistnes et al (2006) control for premium size. While they found that an increase in the premium leads to an increase in the dollar

amount that it is paid by the worker, they found a negative or insignificant effect on the on the share of the premium that is passed on to workers. However, since premiums also reflect unmeasured plan quality, their results may be due to endogeneity.

While the cost of health insurance may affect premium sharing, the types of plan offered by a firm will affect the premiums as well. For example, Feldman et al (1993) found that, although a Health Maintenance Organizations (HMO) plan may reduce the cost of health care by reducing the level of health care utilization, offering an HMO increased the weighted average premium of a firm offering multiple plans. Both Baker and Corts (1995) and Mossirey et al. (2003) conclude that this increase in the average premium is due to the fact that higher HMO penetration decreases the premium on HMO plans but it increases the premium in non-HMO plans, such as Preferred Provider Organization (PPO) or conventional plans.

The existing literature has primarily focused only on the relationship between the cost of the plan and premium sharing, assuming that firms offer only one plan. Vistnes et al. (2006) is the only study that runs separate regression for each plan, but the authors limit their analysis to the effect on the own premium on the “marginal employee premium contribution”, i.e. the difference between required contributions for individual and family coverage. A comprehensive study of how the own-price as well as the cost of other health plans offered by a firm affect the contribution schedule is lacking. This research aims at shedding light on this important issue.

3. Theoretical background

In our simple model, workers need to select a compensation package composed of a wage and health insurance. Assume a firm offers all employees the same wage (w), but offers two health insurance plans with different quality levels, Q_L and Q_H , and associated premiums P_L and P_H ,

with $P_L > P_H$. Employees are heterogeneous according to their preferences over the quality of health insurance. We make the assumption that there are two classes of workers: workers who demand health insurance and workers who do not demand health insurance. Furthermore, we assume that there are two types of workers who demand health insurance: type 1 with a weak preference for health insurance, and type 2 with a strong preference for health insurance.

Workers with high demand are workers who expect a higher health care utilization than workers with a low demand for health insurance. For example, families with children or individuals with health problems are more likely to demand more health services.

Some firms would choose not to offer any health insurance plan. Holding the total compensation package constant, firms that do not offer any plan will pay a higher wage (w^*). When a worker who demands health insurance (high or low quality) is considering a job with a contract $\{w, Q_i\}$ from a firm that offers multiple health insurance plans, she has the option to accept another job which pays w^* and buy health insurance outside the employer plan. Hence, the worker will accept the firm offer $\{w, Q_i\}$ only if:

$$w - C_i \geq w^* - (1 + \tau)P_i \quad i=H,L \quad (2)$$

where C_i represents the contribution to the premium paid by the worker. Equation (2) indicates that health insurance is more expensive if purchased outside the employer plan as firms can bargain a better group insurance rate than individuals.² The factor τ represents the difference between the price of health insurance that can be purchased on the market and the price of the health insurance via employment.

In a world of perfect sorting, firms would choose to offer only one health insurance plan, if any: firms that have access to cheaper health insurance would offer health insurance (Goldstein

² If the employer has not established a flexible health account, the price of insurance purchased outside an employer plan will be higher also because any contribution paid by the employer is tax exempt.

and Pauly, 1976). Workers will sort themselves across firms according to their preferences for health insurance coverage versus monetary wages. Some firms will not offer health insurance and hire only workers that do not demand health insurance; other firms will offer low quality plans and hire only type 1 workers; and the remaining firms will offer high quality plans and hire only type 2 workers. In a more realistic model, firms do not necessarily hire workers with homogeneous preferences with respect to health insurance coverage. Hence, firms may attract better workers by offering multiple plans to more closely match each worker's preference. These firms must choose the employee contribution to each type of health plan, C_L and C_H , in order to minimize their overall cost. Cost minimization implies that, type 1 workers choose the low quality plan and type 2 workers choose the high quality plan. In fact, total expenditure on health benefits would increase if some type 1 worker actually buys the more expensive plan. In a separating equilibrium, the contribution to be paid for the low quality plan has to be lower than the contribution to be paid for the high quality plan, otherwise even the worker with the low preference for health insurance will buy the more expensive plan:

$$C_L < C_H,$$

since C_L cannot be negative, this implies that C_H must always be greater than zero.

An employer that offers multiple health plans will select a wage rate and an employee share (α_i) that minimizes the following problem:

$$\begin{aligned} & \underset{w, C_L, C_H}{\text{Min}} \quad w + \delta[\gamma(P_L - C_L) + (1 - \gamma)(P_H - C_L)] \\ & \text{s.t. equation 2} \\ & C_L \geq 0; w, C_H > 0 \end{aligned} \tag{3}$$

where δ represents the proportion of workers hired by the firm who demand health insurance and γ is the proportion of workers hired by the firm who prefer low quality health insurance. The solution to the above problem depends on the value of δ :

1. If $0 \leq \delta < 1$, the firm will offer a wage $\bar{w} = w^*$, and will choose a contribution schedule $C_L = P_L$ and $C_H = P_H$

If the firm prefers to hire all worker types, they need to offer a wage $w = w^*$. They may offer health insurance, but the full cost of the premium will be paid by workers. A worker who demands health insurance will still buy into the employer plan because the premium would be cheaper than purchasing the same plan outside employment. Since the full price of the premium is paid by workers, the alternative plan premium does not impact worker's contribution.

2. If $\delta = 1$, the firm will offer a wage $\bar{w} = w^* - (1 + \tau)P_L$ and will choose a contribution schedule $C_L = 0$ and $C_H = (P_H - P_L)(1 + \tau)$

If the firm is not concerned with hiring workers who do not demand health insurance, the firm should offer \bar{w} and provide the lower quality plan free of charge. Since $\bar{w} < w^*$, workers who do not demand health insurance will not seek employment at this firm. Note that if workers can purchase health insurance for the same price, employers can bargain a health insurance plan on behalf of their employee (i.e. $\tau = 0$) the result above implies that a firm will contribute the same amount toward each plan type, $(P_H - C_H) = P_L$. Workers who prefer to upgrade to a higher quality plan, will pay for the difference between the cost of the high quality and the low quality plan. This result is consistent with Levy's (1997) "fixed subsidy" hypothesis. Importantly for the purpose of this study, the results in (2) indicate that an employee's contribution to the high quality plan is increasing in the premium of the high quality plan and decreasing in the price of the low quality plan.

2bis. Even if $\delta = 1$, a firm may prefer to pay a higher wage but require a contribution toward the lower quality plan, i.e. $C_L > 0$, and a contribution toward a higher quality plan of $C_H = (P_H - P_L)(1 + \tau) + C_L$

Statement (1) and (2) assumes that workers can get access to health services by purchasing an individual insurance plan on the market or through their employer. However, workers can also get access to health services by seeking coverage under their spouse's employer plan or by joining social programs such as Medicaid. Under this scenario, an employer can save money by raising the employee contribution to incentivize workers to shift toward alternative forms of coverage. This result for firms offering only one plan is derived in Dranove et al. (2000). In this paper we generalize the results in Dranove et al (2000) to firms offering multiple plans. Hence we expect employers to require a contribution from workers even toward the cheapest plan and adjust the premium to the more expensive plans accordingly. Dranove et al. (2000) predict that the employee contribution to the plan should unambiguously increase along with an increase in its premium. Under proposition 2-bis, the "fixed subsidy" becomes $(P_L - C_L)$. This amount should be independent of the high quality premium. Consequently, worker's contribution to low quality plans should also be independent of the high quality premium. Instead, we expect the low quality plan premium to have a negative effect on worker's contribution toward the high quality plan. In fact, on one hand, an increase in the low premium induces an increase in worker's contribution to low quality plans and consequently high quality plans. On the other hand, the increase in the low quality premium will reduce the gap between the high quality and the low quality premium; hence it will decrease the high quality premium. We expect the latter effect to be stronger than the former, because an increase in the low quality premium does not translate in a one-to-one increase in the worker's contribution to the low quality premium

4. Methodology and estimation strategy

The theoretical model posits that firms offering two health insurance plans will set the worker's contribution towards the plan premium as a function of its own premium, and in some cases (e.g. for high quality plans when $\delta=1$) as a function of both premiums. We do not impose these restrictions on the empirical model and we include both premiums in each specification to test that our predictions are correct. The model also predicts that the employee's contribution is a function of the difference between the market price of the premium and the price available through the employer plan. We assume that this difference is a function of the characteristics of the firm, since some firms may have an advantage in bargaining a lower premium.

In our basic analysis, we focus on two types of plans: PPOs and HMOs. This requires us to determine which is considered the more expensive and which one the less expensive plan. Usually PPO plans are considered of better quality than HMO plans because they offer more flexibility in terms of the choice of health care services. Thus, we estimate the model using the worker's contribution to the monthly premium for employer "j" for HMO plans ($ContrHMO_j$) as the contribution for the low quality plan and the employee contribution to the monthly premium for PPO plans ($ContrPPO_j$):

$$\begin{aligned} ContrHMO_j &= \alpha_0 + \alpha_1 prmHMO_j + \alpha_2 prmPPO_j + \gamma X_j + \varepsilon_{1,j} \\ ContrPPO_j &= \beta_0 + \beta_1 prmHMO_j + \beta_2 prmPPO_j + \gamma X_j + \varepsilon_{2,j} \end{aligned} \quad (4)$$

where $prmPPO$ is the monthly PPO premium, $prmHMO$ is the monthly premium for the HMO, X is a vector of firm characteristics and ε is the error term. Since the dependent variable is censored to take values between zero and one, we use the Tobit estimator. The firm characteristics include indicator variables for urban location, union membership, firm size measured by the level of employment, region (Northeast, Midwest, and West with South serving as a comparison group), and a series of industry dummy variables.

A problem that should be taken into account is the possibility that higher premiums reflect an improvement in the quality of the coverage (Jensen and Morrissey, 1990). In this case, an increase in the premium should not necessarily translate into firms passing more of the costs onto their employees (Dranove et al, p.129). If a higher premium reflects a better quality product, the demand for health insurance may increase and workers will not necessarily move to alternative forms of coverage. Hence it is important to control for the quality of the health insurance plan (P_j) as well as factors that may affect the demand for better quality health insurance (W_j). Our final estimation model is:

$$\begin{aligned} \text{ContrHMO}_j &= \alpha_0 + \alpha_1 \text{prmHMO}_j + \alpha_2 \text{prmPPO}_j + \gamma X_j + \delta W_j + \lambda P_j + \varepsilon_{1,j} \\ \text{ContrPPO}_j &= \beta_0 + \beta_1 \text{prmHMO}_j + \beta_2 \text{prmPPO}_j + \gamma X_j + \delta W_j + \lambda P_j + \varepsilon_{2,j} \end{aligned} \quad (5)$$

where W_j is a vector of characteristics of the work force that may affect the demand for health insurance quality, such as the fraction of employees who are making less than \$25,000 per year and if the firm makes the health insurance plans available to part-time and temporary workers. P_j includes variables for plan characteristics such as the annual deductible, an indicator variable for whether the firm's plan is self-insured (rather than underwritten), co-pay and coinsurance rates for each of the following: office visits, hospital visits and generic drug prescriptions, and the hospital visit per diem, if any.

The model will be estimated separately for single and family coverage. We expect the prediction of the proposition (2bis) to apply mostly to the estimation of single coverage, since it is more likely to assume that every worker has a demand for health insurance, hence $\delta=1$. We believe that the predictions from proposition (1) better represent the model for family coverage, since some employees may not have a demand for family health insurance. For example, unmarried individuals do not demand family coverage. In this case, however, we do not necessarily expect individuals to pay the entire premium of the family plan as predicted in

proposition (1) because the contribution for family plan coverage must be linked to the contribution to single family coverage. If an employer share the cost of the single coverage premium with the worker they have to offer a wage below w^* (see proposition 2 and 2bis). Given this level of wages, an individual who demands family insurance would not accept the offer at the firm unless the employer also contributes toward the family plan as well. Hence, while we expect the contribution of the premium paid by the worker to be a function of the price of the specific plan (and not of the alternative plan) as predicted by proposition (1), the coefficient should not be necessarily equal to one.

The model presented in the previous section defined the firm's problem in terms of the level of dollar contributions requested by the employer toward a given health plan. One could also rewrite the problem in terms on the percentage of the premium that the employer requires the worker to pay. Hence as robustness check we estimate the model using the employee share of the premium as dependent variable. In this case, we include the monthly premiums for the PPO and HMO plans in shares rather than levels. It can be shown that the predictions of the effect of the PPO and HMO premiums on the percentage share of the PPO premium paid by the workers are identical to those for the dollar contribution.³ However, the effect of the HMO premium on the percentage share of the HMO premium paid by the workers is less clear, since Dranove et al (2000) indicate that an increase in the premium does not necessarily translate in a one for one increase in the employee's contribution. The results for the premium share estimates are available from the authors upon request.

We use a couple of alternative approaches to estimate equations (4) and (5). First, we exploit the panel nature of the data used for the estimation to control for unobserved heterogeneity among firms that may be correlated with premium rates. However, our use of the

³ Simply dividing the equation of the PPO contribution by the PPO premium will yield this result.

Tobit estimator (to take into consideration that contributions are censored at zero) means we can only control for firm-level random effects. As a robustness check, we also re-estimate our model using a selection estimator. In fact, when estimating equations (4) and (5), a firm is only included in the sample if it offers both a PPO and an HMO plan. However, firms offering multiple types of plans may have unobservable characteristics which also affect premium sharing. For example, firms offering multiple plan types may offer more generous compensation packages in general. To correct for a possible selection problem, we estimate a full maximum likelihood selection model. Determining the selection equation is not as straightforward in this case as in other cases of sample selection. Should we control for selection into the type of plan being analyzed, or into the group of firms offering both an HMO and a PPO plan? We prefer the latter selection process because it maximizes the number of observations. Additionally, the former selection process is conditional to the other plan being offered, which may create an additional selection problem.

5. Data

The estimation employs the 2005-2008 waves of the Employer Health Benefits Survey collected by the Kaiser Family Foundation and the Health Research and Educational Trust. These datasets contain rich information on the types of plans offered by firms, key characteristics for the types of plans offered and key employer information. Completed surveys are available for 2,013 firms in 2005, 2,122 firms in 2006, 1,997 firms in 2007, and 1,927 firms in 2008 leading to a total sample size of 6,132 firm-year observations. The numbers of observations reflect a response rate of just under fifty percent in each year. KFF and HRET attempted to repeat interviews with firms in successive waves of the survey. In order to maintain the general

structure of the sample size, non-responding firms were replaced with a firm belonging to the same industry and size category. The survey identifies ten industry and seven firm size categories.⁴ Interviews were also attempted with non-responding firms from the previous year, so that a firm may be included in the survey in non-consecutive years. The four-year sample includes 816 firms that participated in two out of the four years, 722 firms that participated in three out of the four years and 626 firms that participated in all four surveys.

The information contained in the surveys was obtained through interviews with each firm's benefits manager or human resources manager. Employers are asked whether they offer plans grouped into five categories: conventional plans, health maintenance organization (HMO) plans, preferred provider organization (PPO) plans, point of sale (POS) plans and high-deductible plans (HDP) linked to either a health retirement or health savings account. If the firm offers any plans in a particular category, then information is gathered on the largest plan in that category. Thus, we can not compare premium sharing between plans in the same category, only between plans across categories.

The estimation in this paper focuses on two categories: HMO and PPO. These two types of plans represent the most common plans offered by firms. Table 1 shows that roughly 75 percent of firms offer a PPO plan, while more than one-in-three offer an HMO, followed by POS plans (one-in-four). Also, HMO and PPO plans represent the vast majority of enrollment for the firms in the sample. In fact, PPO and HMO plans together account for about 80 percent of enrollees in each year of the survey. Moreover, the statistics in Table 2 show that HMO and PPO plans are the two plans most likely to be sponsored together by the same firm. Slightly less than one-third of firms offering a PPO also offer an HMO plan (Table 2), while roughly one-in-eight

⁴ The industries are: Mining, Construction, Manufacturing, Transportation / Utilities / Communication, Wholesale, Retail, Finance, Service, Government, and Healthcare. The firm size categories are: 3-9 workers, 10-24 workers, 25-49 workers, 50-199 workers, 200-999 workers, 1000-4999 workers, and 5000+ workers.

will offer a POS plan along with the PPO plan. Conversely, over 70 percent of firms offering an HMO also offer a PPO. Thus, focusing on firms which offer both a PPO and an HMO plan serves as an excellent starting point for the analysis.

Table 3 presents the average premium, worker's contribution and contribution share for all four plan types by year, for the estimation sample. All monetary values are deflated using the CPI and presented in 2005 dollars. The average premium has increased (in constant dollars) each year for all plans over the period under analysis, although the increase was larger for HMO plans (13.2 percent for single coverage and 11.4 percent for family coverage) than for PPO plans (6.7 percent for single coverage and 6.4 percent for family coverage). Together with this increase in the health insurance premiums, we observe an increase of the size of the worker's contribution. However, this increase does not always translate in a higher share of the cost paid by workers. In fact, worker's contribution shares seemed to have grown between 2005 and 2006 but decreased afterward.

Table 4 presents summary statistics for the key variables used in the analysis (again, all monetary values are presented in 2005 dollars). The average monthly premium for single plans is \$390.73 and \$336.62 for PPO and HMO plans, respectively. For family plans, the corresponding figures are \$1,066.67 and \$964.66. This finding reinforces our assumption that the HMO is the low quality plan and the PPO is the high quality plan, since the low quality plan has to be cheaper than the high quality plan. The average employee's premium share for PPO plans for single (family) coverage is 19.6 (28.3) percent. For HMO plans, the corresponding figures are 16.9 (single) and 26.9 (family) percent. On average, workers pay a smaller share of the premium for HMO plans. We can also see that employees pay a greater share of the premium for family coverage relative to single coverage. Furthermore, the data show significant variation

in plan costs and contribution rates. In PPO plans, the average co-pay for an office visit is \$13.97 while the average hospital visit co-pay is \$62.03 and \$8.69 for generic drug prescriptions. Although HMO plans are cheaper, they have higher co-pays: the average co-pay for an office visit is \$14.86 while the average co-pay is \$104.41 for a hospital visit and \$9.08 for generic drug prescriptions. These variables provide some indication of the plan's quality; however it is not the only indicator. PPO plans offer enrollees greater physician choice, and are less likely to require referrals from the primary physician in order to see a specialist. Thus, because of these features, PPO plans are generally considered better by potential enrollees than HMO plans offering otherwise similar characteristics.

5. Results

Tables 5 and 6 present the results of the Tobit random effects. We estimate both the basic and extended models for HMO and PPO plans using the employee's contribution towards the monthly premium in levels as the dependent variable. We treat the PPO as the higher quality plan, relative to HMO plans. We predict that family coverage contributions should be in line with proposition (1) while single coverage contributions are in line with proposition (2.bis). We include both premiums in each specification even if the theory clearly that both premiums matter only for the contributions toward single coverage PPO plans when $\delta < 1$. We prefer not to impose any restriction on the estimation and test that our predictions are correct.

The estimates for the empirical models using information on family coverage are presented in Table 5. These results support our predictions after we control for plan characteristics. The results show that the worker's contribution towards the HMO premium is not a function of the PPO premium (column 1). Also, consistent with the theory, we see that

firms facing higher premiums pass on some of the higher cost to their employees. For every dollar increase in the HMO monthly premium, on average, the worker's contribution increases by 22 cents. Thus, firms are still absorbing the majority of the rise in health insurance premiums. The estimates for the firm characteristic variables show greater variation between the baseline and the augmented model, indicating that some plan characteristics are correlated with firm characteristics. Hence we will focus on the augmented model, which includes plan characteristics. Larger firms tend to require a lower contribution from workers while firms with a larger fraction of low-income workers tend to require a large contribution towards the premium. As expected, unionized firms incur a greater share of the costs supporting the prediction that unions can use their bargaining power to negotiate greater benefits concessions from employers; on average, workers in unionized firms pay \$64.47 less per month than workers in non-unionized firms with comparable plans. Firms in all three regions: Northeast, Midwest and West require lower contributions from their workers relative to firms in the South. These results may reflect differences in labor market tightness between the regions, although the regions are so broadly defined that they cover areas which are likely to contain significant internal variation in both labor market conditions and institutional factors such as state laws. The results do not vary much after controlling for plan characteristics (column 2).

Columns 3-4 present the results for the PPO estimates for the family plans. The results show that the employees' dollar contribution increases with the monthly PPO premium and has a small, negative correlation with the monthly HMO premium for family coverage that becomes insignificant after controlling for the plan characteristics. A one dollar increase in the PPO premium is associated with a roughly 30 cent increase in the employee's contribution. Again, we see that larger firms require smaller contributions from their employees, while firms with

more low-income workers require larger contributions. As with the HMO regressions, unionized workers contribute less towards the premium. On average, workers in the Northeast, Midwest and the West all contribute less, *ceteris paribus*, than workers in the South.

Next, we estimate the models using information on HMO and PPO plans for single coverage (Table 6). Here, the results show mixed support for our theoretical predictions. The results for PPO plans (columns 3-4) support the predictions, showing that employee contributions towards the PPO premium are increasing in the monthly PPO premium, but decreasing in the HMO premium. A one dollar increase in the PPO (HMO) premium corresponds to a 22.5 cent increase (4.1 cent decrease) in the workers' contribution. The results for HMO plans (columns 1-2) give credit to the hypothesis that employers may ask workers to contribute toward the cheaper plan to induce some workers to find alternative form of coverage. In fact, even for HMO plans we found that for one dollar increase in the own premium, employer raise the worker's contribution by 16 cents. However, contrary to our prediction we found that cross-plan price (PPO premium) also affects the contribution toward the HMO plan. Overall these findings are consistent with the firms taking on the majority of the additional burden as health insurance costs rise. In contrast to the family coverage estimates, we find that larger firms require greater contributions towards the monthly premium for single HMO plans, but this effect is significant only in the HMO equation. Again, we see that employees working in a firm with a high fraction of low-income workers contribute more towards the monthly premium; however the effect is economically very small (a ten percentage point increase in the fraction of low-income workers corresponds to a less than five cent increase in the monthly worker contribution). As with the family plans, unionized workers also contribute less towards the

monthly premium (for both types of plans). For PPO plan, firms in the Northeast require larger contributions while for both plan types firms in the West require smaller contributions.

Finally, Table 7 presents the results for the full maximum likelihood function selection estimator. Since we observe several firms multiple times over time, we clustered the error terms at the single firm level. For the sake of brevity, only the coefficients on the monthly premium variables are presented. In each case, the extended model is estimated and all models include industry and year indicators. The selection equation contains the same set of controls as the outcome equation, thus the system is identified by the non linearity of the inverse Mills ratio.⁵ The results of the selection model support the results presented in Tables 5 and 6, although the coefficient of the plan premiums are smaller in the selection model. Workers' contributions toward family plans are only a function of their own plan rate, while their contributions toward single coverage are a function of both premiums. These results do not necessarily coincide with our theoretical prediction. However, one needs to remember that the theoretical model assumes that the high quality model is always the more expensive model, while in the empirical estimation we make the assumption that the high quality model is the PPO plan. While on average the PPO premiums are higher than the HMO premium (see Table 3), a not trivial number of observations (23 percent) report a HMO premium higher than a PPO premium, which may affect our estimation. Moreover, the significance of the coefficient on the PPO premium in the worker's contribution toward the single coverage HMO plan may indicate that workers consider the two plans to be good substitutes to each other. As such, when one plan becomes more expensive, employers push their employees toward the other plan by decreasing the contribution toward the alternative plan.

⁵ We also estimated a model where workers characteristics affect the probability of offering both HMO and PPO plans but not the premium sharing. We found that the results are identical to those reported in Table 7 except for the HMO single coverage equation, where the HMO plan premium is found to have a bigger coefficient (0.142).

6. Conclusions

This paper developed a simple model of how firms determine employee contributions towards health insurance premiums when multiple plans of different quality are offered. The model predicts two possible scenarios: (1) every employee demand health insurance; (2) some employees do not demand health insurance. We identify the market for individual coverage as the scenario in which each agent demands health coverage, while the market for family coverage as the market in which some individual do not demand coverage.. Our model predicts that when some individuals do not demand health insurance, the contribution toward each plan should be a function of the own price. Instead, when every worker demand health insurance, that worker contributions towards the low cost plan should be increasing in the own-plan price while the contribution toward the more expensive plan will be increasing in the expensive plan price and decreasing in the price of the lower-cost plan. The empirical estimation using firm-level data from 2005-2007 is based on the assumption that HMO plans are low quality plans and PPO plans are high quality plans. This selection was supported by the fact that PPO plans are on average more expensive than HMO plans, although for a non trivial number of observation the opposite is actually true, which may explain why our empirical results do not always follow the theoretical prediction.

Consistent with the theoretical prediction, estimates show a positive and highly statistically significant correlation between the worker's contribution to the family coverage plan and that plan's monthly premium. The estimation of the worker contribution to a single coverage plan is found to increase in the own-plan price and decrease in the other plan price. The latter result is consistent with the theoretical prediction for the PPO premium sharing but not for

the HMO premium sharing. Overall, we notice that despite recent complaints that firms are pulling back from paying for health benefits, the firm always absorbs the larger share of the increase in the cost of health insurance. In fact, firms make employees pay always less than half of the increase in the cost of the premium. However, since there is a trade off between monetary compensation and fringe benefits, the increase in the cost of health insurance together with a relative modest increase in the worker's contribution may explain why nominal salaries have grown relatively slower than the cost of health insurance over the period under analysis.

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Table 1: Offer and coverage rates for different types of plans

	2005	2006	2007	2008	2005-08
Percent of firms offering a conventional plan	9.93	9.62	7.88	5.91	8.37
Percent of firms offering an HMO plan	35.37	33.75	32.46	32.43	33.51
Percent of firms offering a PPO plan	76.64	74.78	74.39	74.32	75.03
Percent of firms offering a point of sale plan	25.05	22.42	22.89	21.57	22.99
Percent of employees enrolled in a conventional plan	3.96	4.56	2.91	2.65	3.54
Percent of employees enrolled in an HMO plan	20.32	19.22	17.88	18.24	18.92
Percent of employees enrolled in a PPO plan	60.65	58.4	57.87	57.8	58.68
Percent of employees enrolled in a point of sale plan	15.07	14.17	15.81	14.07	14.78
Number of observations	1,832	1,923	1,839	1,776	7,370

Table 2: conditional probability of offering a particular type of health insurance plan

	2005	2006	2007	2008	2005-08
Of the firms offering an HMO plan:					
Percent offering a PPO plan	71.76	71.65	73.53	71.00	71.98
Percent offering a POS plan	23.92	20.8	19.43	20.66	21.26
Of firms offering a PPO plan:					
Percent offering an HM O plan	33.12	32.34	32.09	30.98	32.15
Percent offering a POS plan	13.82	12.44	11.11	10.30	11.95
Of firms offering a POS plan:					
Percent offering an HM O plan	33.77	31.32	27.55	31.07	30.99
Percent offering a PPO plan	42.27	41.53	36.1	35.51	39.02

Table 3: Premiums, worker contributions and shares by plan type for firms offer both HMO and PPO plans

Health Maintenance Organization (HMO):	2005	2006	2007	2008	2005-2008
Monthly premium for single coverage	317.42	332.93	339.29	359.77	336.62
Worker's contribution for single coverage	50.53	55.77	56.84	58.65	55.33
Percent worker's contribution for single coverage	16.42	17.25	17.17	16.75	16.9
Observations	465	465	439	409	1,778
Monthly premium for family coverage	880.25	912.13	943.46	980.51	927.31
Worker's contribution for family coverage	224.59	245.72	248.95	254.09	242.93
Percent worker's contribution for family coverage	26.08	27.26	26.83	26.22	26.6
Observations	463	464	438	409	1,774
Preferred Physician Organization (PPO):	2005	2006	2007	2008	2005-2008
Monthly premium for single coverage	378.88	385.48	396.23	404.29	390.73
Worker's contribution for single coverage	70.92	76.56	78.36	77.14	75.66
Percent worker's contribution for single coverage	18.87	19.98	20.07	19.42	19.58
Observations	465	465	439	409	1,778
Monthly premium for family coverage	1,034.05	1,050.48	1,088.01	1,099.09	1,066.67
Worker's contribution for family coverage	289.33	305.05	306.72	301.79	300.61
Percent worker's contribution for family coverage	27.86	28.78	28.17	27.74	28.15
Observations	463	464	438	409	1,774

All monetary values presented in 2005 dollars.

Table 4: Summary statistics

	Mean	Std. Dev.	Observations
Worker's monthly contribution: single PPO plan	75.66	61.61	1,778
Worker's monthly contribution: single HMO plan	55.33	46.44	1,778
Worker's monthly contribution: family PPO plan	300.61	219.63	1,774
Worker's monthly contribution: family HMO plan	242.93	169.82	1,774
Monthly premium for single PPO plan	390.73	108.09	1,778
Monthly premium for single HMO plan	336.62	87.39	1,778
Monthly premium for family PPO plan	1,066.67	275.54	1,774
Monthly premium for family HMO plan	964.66	231.9	1,774
Total employment*	6,577	18,279	1,778
Percent employee's low income (<\$25,000)	12.9	17.1	1,778
Urban location indicator	0.95	0.218	1,778
Union indicator	0.492	0.5	1,778
Part time workers eligible for insurance indicator	0.591	0.492	1,778
Temporary workers eligible for insurance indicator	0.085	0.28	1,778
Northeast region indicator	0.249	0.433	1,778
Midwest region indicator	0.453	0.838	1,778
West region indication	0.208	0.406	1,778
Annual deuctible single PPO	272.19	338.04	1,778
Annual deductible family PPO	579.53	717.23	1,774
Self insure dummy PPO	0.605	0.4689	1,778
Office visit copay PPO	13.97	8.51	1,774
Office visit coinsurance rate PPO	2.89	6.71	1,778
Hospital visit copay PPO	62.03	136.24	1,763
Hospital visit coinsurance rate PPO	6.9	8.5	1,775
Hospital visit per diem PPO	3.37	29.11	1,778
Generic drug copay PPO	8.69	3.69	1,682
Generic drug coinsurance rate PPO	2.2	6.56	1,672
Annual deuctible single HMO	56.55	197.78	1,778
Annual deductible family HMO	115.19	414.66	1,774
Self insure dummyHMO	0.34	0.474	1,778
Office visit copay HMO	14.86	6.27	1,778
Office visit coinsurance rate HMO	0.347	2.3	1,778
Hospital visit copay HMO	104.41	159.43	1,769
Hospital visit coinsurance rate HMO	1.72	5.06	1,776
Hospital visit per diem HMO	10.42	49.99	1,778
Generic drug copay HMO	9.08	3.98	1,701
Generic drug coinsurance rate HMO	0.951	4.65	1,701

All monetary values reported in 2005 dollars.

*Total employment variable top-coded at 500 employees in 2008.

Table 5: Employee's contribution for family plans

	Contribution to HMO Plan		Contribution to PPO Plan	
	1	2	3	4
Monthly PPO premium	-0.025 (0.015)	-0.016 (0.019)	0.303** (0.018)	0.307** (0.018)
Monthly HMO premium	0.222** (0.018)	0.217** (0.019)	-0.04† (0.021)	-0.031 (0.021)
Log total employment	-7.856** (2.516)	-9.2** (2.588)	-14.54** (2.934)	-8.226* (3.482)
Percent employees low income	1.382** (0.205)	1.356** (0.208)	1.313** (0.238)	1.449** (0.244)
Urban indicator	15.65 (21.07)	13.28 (22.0)	25.16 (20.62)	38.73† (21.61)
Union indicator	-64.47** (9.367)	-57.19** (9.539)	-73.23** (10.83)	-56.37** (11.3)
Part time workers eligible	-3.494 (8.115)	-2.245 (8.126)	-4.03 (9.467)	-5.742 (9.658)
Temporary workers eligible	-3.209 (12.63)	7.182 (13.276)	5.287 (14.96)	8.979 (16.75)
Northeast indicator	-76.88** (12.87)	-60.46** (12.66)	-78.77** (15.67)	-78.79** (15.57)
Midwest indicator	-23.97** (6.41)	-21.12** (6.53)	-30.228* (7.33)	-26.68** (8.32)
West indicator	-60.08** (14.15)	-57.75** (14.02)	-34.85** (16.69)	-32.86** (16.55)
Plan characteristics	no	yes	no	yes
Log likelihood	-10629.62	-10138.10	-11068.62	-10377.77
Observations	1,774	1,688	1,774	1,655
Firms	954	931	954	922

All models include year and industry indicators.
Standard errors in parenthesis

Table 6: Employee's contribution for single plans

	Contribution to HMO Plan		Contribution to PPO Plan	
	1	2	3	4
Monthly PPO premium	-0.065** (0.014)	-0.067** (0.016)	0.229** (0.016)	0.225** (0.017)
Monthly HMO premium	0.145** (0.015)	0.161** (0.014)	-0.037* (0.017)	-0.041* (0.019)
Log total employment	2.969** (0.868)	2.723** (0.923)	0.389 (1.037)	0.797 (1.153)
Percent employees low income	0.406** (0.069)	0.422** (0.07)	0.391** (0.082)	0.403** (0.086)
Urban indicator	-0.265 (6.982)	0.074 (7.279)	21.59 (7.79)	21.36* (7.927)
Union indicator	-18.57** (3.161)	-17.78** (3.285)	-20.35** (3.844)	-18.9** (4.022)
Part time workers eligible	3.439 (2.692)	3.613 (2.731)	0.316 (3.227)	0.854 (3.366)
Temporary workers eligible	-7.379 (4.503)	-7.208 (4.545)	-8.614† (5.139)	-8.373 (5.541)
Northeast indicator	4.198 (4.303)	6.193 (4.381)	7.958 (5.298)	11.002* (5.514)
Midwest indicator	2.026 (2.283)	1.746 (2.249)	-0.794 (2.777)	-1.084 (2.87)
West indicator	-17.31** (4.534)	-17.26** (4.517)	-13.31* (6.056)	-11.76† (6.132)
Plan characteristics	no	yes	no	yes
Log likelihood	-7854.68	-7483.7	-8658.28	-8145.76
Observations	1,778	1,692	1,778	1,658
Firms	956	933	956	924

All models include year and industry indicators.
Standard errors in parenthesis

Table 7: Heckman selection estimation

	Family Coverage		Single Coverage	
	HMO	PPO	HMO	PPO
Monthly HMO premium	0.18** (0.039)	-0.039 (0.035)	0.07** (0.018)	-0.056** (0.028)
Monthly PPO premium	-0.01 (0.020)	0.23** (0.04)	-0.05** (0.011)	0.11** (0.038)
Observations	7,280	7,280	7,280	7,280
Test for independent equations	327.97 (0.00)	154.3 (0.00)	44.87 (0.68)	128.35 (0.00)

The selection equation defined the probability that the firm offers both an HMO and a PPO plan. Standard errors are clustered at the firm level.