

## HEALTH INSURANCE COST AND PREMIUM SHARING

*Vasilios D. Kosteas*  
Assistant Professor  
Department of Economics  
Cleveland State University  
[b.kosteas@csuohio.edu](mailto:b.kosteas@csuohio.edu)  
2121 Euclid Avenue, RT 1712  
Cleveland, OH 44115-2214

*Francesco Renna*  
Associate Professor  
Department of Economics  
The University of Akron  
[frenna@uakron.edu](mailto:frenna@uakron.edu)  
290 Buchtel Common  
Akron, OH44325-1908

### *Abstract:*

The employer-based health insurance is the single most important form of insurance coverage in U.S.: nearly two-thirds of the population under 65 seeks coverage through their employer. Most employers have chosen to offer health insurance as a fringe benefit to attract employees. In fact, employment-based health insurance is likely to be less expensive than individually purchased coverage (for the same set of benefits). However, employees may have heterogeneous preferences with respect to the level of coverage desired. Employers may offer multiple health insurance plans and use employee premium sharing to sort workers according to how they value health insurance. Moreover employee can use the premium sharing as a strategy to push employees to seek alternative forms of insurance. The benefits of sorting workers increase with the cost 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. We focus on firms that offer HMO and PPO. We find that the worker’s premium share to PPO plans increases with the PPO premium and decreases with the HMO premium. The results hold true for both individual and family plans. The worker’s premium share for HMO family plans is not affected by the PPO premium, but is decreasing in its own price. The worker’s share for HMO individual plans is decreasing in both premiums.

## 1. Introduction

Health insurance costs 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 and 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.

As the cost of health insurance increases, the percentage of firms that offered health benefits decreased from 69% to 60% from 2000 to 2007, although this drop seem 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 conclusions in many studies that a firm's decision to offer health insurance is price inelastic.<sup>1</sup> Although the size of the premiums does not seem to have an impact the firm's 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 for family

---

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

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 the 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. However, 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 the large firms offer multiple plans. This paper is the first study of the effect of health insurance premiums on cost sharing for firms offering multiple plans. Our results are consistent with a simple model which predicts that a worker's contribution towards the more expensive plan will increase with the more expensive plan's premium and decrease with the less expensive plan's premium. These results hold for both family and single coverage plans. Workers' contributions towards the cheaper plan are increasing in that plan's price for both family and single coverage. However, the results for single coverage also show that the employee's contribution is increasing in the cost of the more expensive plan. This is the only finding which is not consistent with our predictions. The rest of the paper is organized as follows: 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, greater union penetration, and greater share of workers 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 the price effects, do not have a significant impact on the employers' 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 decrease: 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 onto 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 employees' contribution to encourage them to obtain coverage from their spouses' employer. Both Dranove et al (2000) and Vistnes et al (2006) control for the 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 the 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 the Preferred Provider Organization or conventional plans.

In summary, the current literature has focused on either the relationship between the costs of the plan and the share of the premium assuming that firms offer only one plan. Vistnes et al. (2006) is the only study that explicitly looks at multiple plans, but the author analyzes only the effect of a single coverage plan premium on the gap between individual and family coverage required contribution. A comprehensive study of how the own-price and 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 they offer 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 that 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 the 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 cheaper if purchased outside the employer plan as firms can bargain a better group insurance rate than individuals.<sup>2</sup> The factor  $\tau$  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 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; 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 accommodate each worker's preference. These firms must choose the employee contributions to each type of health plan,  $C_L$  and  $C_H$  in order to minimize their overall cost. In the separating equilibrium type 1 workers choose the low quality plan and type 2 workers choose the high quality plan. If a separating equilibrium exists, 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 high quality plan:

$$C_L < C_H ,$$

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

---

<sup>2</sup> 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.

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

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

where  $\delta$  represents the proportion of workers hired by the firm who demand health insurance and  $\gamma$  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  $\delta$ :

- i. 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.

- ii. 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 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 the 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 play for the difference between the cost of the high quality and the low quality plan. This result is consistent with Levy (1997) “fixed subsidy” hypothesis. Importantly

for the purpose of this study, the results in (ii) indicate that an employee 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.

- iii. *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 (i) and (ii) 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 is derived in Dranove et al. (2000). 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. Following Dranove et al. (2000), the employee contribution to the low quality plan should unambiguously increase along with an increase in the low quality plan premium. Similarly to the previous statement, (ii) model predicts that both the level of the employee contribution to the high quality plan should increase with the premium of the high quality plan and decrease with the premium of the low quality plan.

#### **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 for the low quality plan ( $Contr_{Low}$ ) as a function of the own premium ( $Premium_{Low}$ ) while the contribution towards the plan premium for the high quality plan ( $Contr_{High}$ ) is a function of the monthly premiums for both the more ( $Premium_{High}$ )

and less expensive plans ( $Premium_{Low}$ ). 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. The model's predictions can be stated in terms of either the worker's contribution towards the monthly premium either in levels or as a share of the total premium (Lee, 2002).

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 the 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 ( $ContrPPO_j$ ):

$$\begin{aligned} ContrHMO_j &= \alpha + \beta_1 prmHMO_j + \gamma X_j + \varepsilon_j \\ ContrPPO_j &= \alpha + \beta_1 prmHMO_j + \beta_2 prmPPO_j + \gamma X_j + \varepsilon_j \end{aligned} \quad (4)$$

where  $prmPPO$  is the monthly PPO premium,  $prmHMO$  is the monthly premium for the HMO,  $X$  is a vector of firm characteristics  $\varepsilon$  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's size measured by the level of employment, whether part time workers are eligible for health insurance, whether temporary workers are eligible, region (Northeast, Midwest, and West with South serving as a comparison group), and a series of industry dummies 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 Morrisey, 1990). In this case,

an increase in the premium should not translate necessarily in a higher cost passed on employees (Dranove et al, p.129). If a higher premium reflects a better quality product, 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:

$$\begin{aligned} \text{ContrHMO}_j &= \alpha + \beta_1 \text{prmHMO}_j + \gamma X_j + \delta W_j + \lambda P_j + \varepsilon_j \\ \text{ContrPPO}_j &= \alpha + \beta_1 \text{prmHMO}_j + \beta_2 \text{prmPPO}_j + \gamma X_j + \delta W_j + \lambda P_j + \varepsilon_j \end{aligned} \quad (5)$$

where  $W_j$  includes workers characteristic 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 the fractions of employees under the age of 26.  $P_j$  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. Both the basic model and the extended model are estimated separately for single and family plans. These models are estimated using random effects tobit estimation.

The model will be estimated separately for single and family coverage. While we expect the results of the estimation for the PPO contribution equation to be invariant to the form of coverage, we expect the results of the estimation for the HMO contribution equation to be stronger for the family coverage. Our simple model clearly predicts that the worker contribution toward the PPO plan should be negatively affected by the PPO plan premium and positively affected by the HMO plan premium independently from whether outside coverage options are available to the worker. Instead, worker contributions toward the HMO plan should be negatively affected by the HMO plan premium only when employers push workers to seek coverage through alternative sources. Although everybody has the option of seeking coverage

through social program such as Medicaid, outside coverage through the spouse's employer is an option available only to married individuals. As such our model should best capture the dynamics of the family premium rather than the single coverage.

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 as the model also estimate the model using both the employee share of the premium as dependent variable. In this case, we include the monthly premiums for the PPO and HMO plans in levels, rather than logs. 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.<sup>3</sup> 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 of does not necessarily translate in a one to one increase in the employee's contribution. The results for the premium share estimates are available upon request.

As a robustness check, we also estimate the four models using the Heckman selection estimator. For the results presented in tables five and six, a firm is only included in the sample if it offers both a PPO and an HMO plan. 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. In that case, we would expect these firms to pass on less of the monthly premium to their workers.

Determining the selection equation is not as straightforward in this case as it is in some other applications of the selection model. Should we control for selection into the type of plan

---

<sup>3</sup> Simply dividing the equation of the PPO contribution by the PPO premium will yield this result.

being analyzed, or into the group of firms offering both an HMO and a PPO plan? Since there is no simple answer to this question, we present two sets of estimates using the Heckman selection estimator. The first set uses the probability that the firm offers the type of plan being analyzed as the selection equation, while the second set uses the probability that the firm offers both types of plans as the selection equation. In both cases, indicator variables for whether part time and temporary workers are eligible for the health insurance plans are used as the identifying variables.<sup>4</sup>

## 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. The 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 and 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 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 sample size, non-responding firms were replaced with a firm belong to the same industry and size category. The survey identifies ten industry and seven firm size categories.<sup>5</sup> Interviews were also attempted with non-responding firms from the previous year, so that a firm may be included the survey in

---

<sup>4</sup> The coefficients for these variables are generally not statistically significant in the random effects tobit model estimates. Thus, they are excluded from the second stage of the selection model and used only in the first stage as identifying variables.

<sup>5</sup> 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.

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 (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 vast majority of enrollment for the firms in the sample. Table 1 shows that the majority of covered employees were enrolled in a PPO plan in each year. HMO plans are the second most enrolled-in plans, followed by POS plans. Between them, these two types of plans account for about 80 percent of enrollees in each year of the survey.

In particular, we focus on cases where firms offer at least two of these types of plans. A basic analysis employs observations where firms offer both a PPO and an HMO plan. As shown in Table 1, roughly 75 percent of firms offer a PPO plan, while more than one-in-three offer an HMO. Slightly less than one-third of firms offering a PPO also offer an HMO plan (Table 2), while roughly one-in-eight will offer a POS plan along with the PPO plan. Conversely, over 70 percent of firms offering an HMO also offer a PPO. Overall, the statistics in Table 2 show that HMO and PPO plans are the two plans most likely to be sponsored by the same firm. Thus,

focusing on firms which offer both a PPO and an HMO plan serves as an excellent starting point for the analysis.

Table 4 presents summary statistics for the key variables used in both the premium contribution and premium share estimates. The average monthly premium for single plans is \$406.26 and \$349.2 for PPO and HMO plans, respectively. For family plans, the corresponding figures are \$1,110 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. Nearly all firms are located in an urban area while slightly less than half are unionized workplaces. In PPO plans, the average co-pay for an office visit is \$14.66 while the average hospital visit co-pay is \$64.84 and \$9.15 for generic drug prescriptions. In HMO plans, the average co-pay for an office visit is \$15.58 while the average co-pay is \$98.81 for a hospital visit and \$9.53 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

The estimates for the empirical models using information on family coverage are presented in Table 5. 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. Thus, according to the theoretical models predictions, the employee's contribution towards the insurance premium for the PPO plan should be positively correlated with the monthly premium for that plan and negatively correlated with the monthly premium for the HMO plan. However, we should see that the worker's contribution towards the HMO premium is increasing in the HMO plan premium but does not depend on the PPO plan premium. We include the PPO plan premium even in the HMO regression and test the hypothesis that the PPO plan premium does not affect the level of contribution required by the firm toward the HMO plan.

The results for the family plans support these predictions for the HMO plan (columns 1-2). The coefficient estimates for the monthly premium variables are very similar for the basic and the extended models. The results show that the worker's contribution towards the HMO premium is not a function of the PPO premium, as predicted by the theory. 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 twenty-two 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 two specifications. We will focus on the augmented model, which includes plan characteristics. Larger firms tend to require a lower contribution from workers (\$9.84), 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 \$61.44 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.

Some of the plan characteristics have statistically significant coefficients. Firms whose plan has a higher annual deductible require lower contributions; every hundred dollar increase in the annual deductible is associated with a \$2.40 decrease in the employee's monthly contribution (or \$28.8 annually). At the same time, firms whose plans have higher co-pays for office visits, hospital visits and generic drug prescriptions and larger hospital coinsurance rates tend to pass on more of the plan costs to their employees. Higher co-pays reflect lower plan quality, thus it appears that workers pay more when plan quality is lower. Differences in plan quality may reflect differences in local insurance market conditions, including firms' buying power in those markets, more than employee demand for plans of varying quality. Alternatively, the observed relationship may be reflecting firm specific characteristics: firms choosing lower quality plans also pass on more of the insurance costs to their employees. Given that we can not control for firm specific effects, we should withhold any conclusions about how plan quality affects premium sharing.

Columns 3-4 present the results for the PPO estimates for the family plans. In this case, the results provide mixed support for the theoretical model's predictions. 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. A one dollar increase in the PPO premium is associated with a roughly thirty-one cent increase in the employee's contribution, while a one dollar increase in the HMO premium is associated with a roughly three cent decrease in the workers' contribution to the PPO plan. However, the latter coefficient is not statistically significant. 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. Overall, the findings presented in table 5 provide mixed support for the predictions of the theoretical model developed in section three.

Next, we estimate the models using information on HMO and PPO plans for single coverage (Table 6). Again, the results show mixed support for the theoretical predictions. The results for PPO plans (columns 3-4) support the predictions. The estimates show 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 23.6 cent increase (4.2 cent decrease) in the workers contribution. Again, the own-price findings are consistent with the firms taking on the majority of the additional burden as health insurance costs rise. As expected, we find that employee contributions towards the HMO plan are increasing in the own-plan price (HMO premium), however contrary to our

prediction we found that cross-plan price (PPO premium) also affects the contribution toward the HMO plan.

In contrast to the family coverage estimates, we find that larger firms require greater contributions towards the monthly premium for single HMO plans. Here, a one percent increase in firm size is associated with a roughly three dollar increase in the worker's monthly contribution. 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 both plan types, firms in the Northeast require larger contributions while firms in the West require smaller contributions. Overall, the results for the single coverage models generally support the theoretical predictions. The one exception is the observed negative and statistically significant correlation between HMO contributions and PPO premiums.

Finally, table seven presents the results for the Heckman selection estimator. 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 results in panel A use the probability of offering the type of plan being analyzed as the selection equation. For example, the results in columns one and three control for selection into the group of firms offering an HMO plan. In this case, the results support the theoretical predictions for both the HMO and PPO plans. The worker's monthly contribution to the HMO plan premium (column 1) is positively correlated with the HMO monthly premium but not correlated with the monthly PPO premium. The employee's monthly contribution is positively correlated with the

monthly PPO premium and negatively correlated with the monthly HMO premium. These results provide stronger support for the theoretical model than those presented in table five. The results for single coverage plans (columns 3-4) are qualitatively consistent with those presented in table six. The results in panel B, which use whether the firm offers both types of plans as the dependant variable in the selection equation, generally do not support the theoretical predictions. For the most part, these results show that the worker's contribution towards a given plan is only a function of the own plan premium. The only exception is the single HMO plan contribution, which continues to show a negative correlation between the monthly PPO premium and the worker's contribution.

## **6. Conclusions**

This paper developed a simple model to show how firms determine employee contributions towards health insurance premiums when multiple plans are offered. The model predicts that worker contributions towards the more expensive plan will be increasing in the own-plan price and decreasing in the price of the lower-cost plan. Empirical estimates using firm-level data from 2005-2007 provide mixed results for these predictions. Estimates consistently show a positive and highly statistically significant correlation between the worker's contribution to the health insurance plan and that plan's monthly premium. However, there is less support for the model's prediction of a negative correlation between the worker's contribution to the higher quality plan and the monthly premium for the lower quality plan. We can say that firms with higher costs of providing health insurance coverage, as reflected in higher premiums tend to pass on much less than half of the higher cost to their workers.

## REFERENCES

- Baker, Laurence C., and Kenneth S. Cortis (1995). "The Effects of HMOs on Conventional Insurance Premiums: Theory and Evidence", *NBER working paper* 5356.
- Buchmueller, T., P. Cooper, K. Simon and J. Vistnes (2005). The Effect of SCHIP Expansions on Health Insurance Decisions by Employers, *Inquiry*, 42(3): 218–231.
- Crimmel, Beth Levin (2003), "Employee Choice in Employer-Sponsored Health Insurance Plans: 2001", Center for Financing, Access, and Cost Trends, AHRQ, Medical Expenditure Panel Survey-Insurance Component: *Statistical Brief #29*
- Cutler, David M. (2003), "Employee Costs and the Decline in Health Insurance Coverage," *Forum for Health Economics & Policy*: Vol. 6: (Frontiers in Health Policy Research), Article 3. <http://www.bepress.com/fhep/6/3>
- Kaiser Family Foundation, and Health Research & Educational Trust, (2007), *Employer Health Benefit 2007 Annual Survey*, Menlo Park, CA: Henry J. Kaiser Family Foundation
- Dranove, David, Kathryn E. Spier, Laurence Baker (2000), "Competition among Employers Offering Health Insurance" *Journal of Health Economics*, Vol.19: 121–140
- Eibner, Christine, and M. Susan Marquis (2008), "Employers' health insurance cost burden, 1996–2005" *Monthly Labor Review*, June 28-44
- Feldman, Roger, Bryan Dowd, and Gregory Gifford (1993) "The Effect of HMOs on Premiums in Employment-Based Health Plans", *Health Services Research*, Vol. 27 (6): 779-811
- Jensen, Gail A. and Michael A. Morrissey (1990) "Group Health Insurance: A hedonic Price approach", *The Review of Economics and Statistics*, 38-44.
- Lee, Jason (2002), "Are Health Insurance Premiums Higher for Small Firms?", Robert Wood Johnson Foundation: *Research Synthesis Report No. 2*  
<http://www.rwjf.org/files/research/no2researchreport.pdf>
- Goldstein, Gerald S., and Mark V. Pauly (1976), "Group Health Insurance as a Local Public Good Chapter" in Richard N. Rosett *The Role of Health Insurance in the Health Services Sector* , NBER: 73 - 114
- Gruber, Jonathan and McKnight Robin (2003), "Why Did Employee Health Insurance Contributions Rise?", *Journal of Health Economics*, Vol. 22, No. 6: 1085-1104
- Marquis, Susan M. and Stephen H. Long (2001), "Employer Health Insurance and Local Labor Market Conditions", *International Journal of Health Care Finance and Economics*, Vol. 1: 273–292.

Marquis, Susan M. and Stephen H. Long (2001), “To Offer or Not to Offer: The Role of Price on Employer’s Health Insurance Decisions”, *Health Service Research*, Vol. 36, No. 5: 935-58.

Morrisey, M.A., G.A. Jensen and J. Gabel. (2003). “Managed Care and Employer Premiums.” *International Journal of Health Care Finance and Economics* 3(2): 95–116.

Vistnes, Jessica Primoff, Michael A. Morrisey, and Gail A. Jensen (2006) “Employer choices of family premium sharing”, *International Journal of Health Care Finance and Economics*, Vol. 6: 25–47.

Shore-Sheppard, L., T.C. Buchmueller and G.A. Jensen. (2000). “Medicaid and Crowding Out of Private Insurance: A Re-examination Using Firm Level Data.” *Journal of Health Economics*, 19 (1): 61–92.

Zawacki, Alice M, and Taylor Amy K. “Contributions to Health Insurance Premiums: When Does the Employer Pay 100 Percent?”. Agency for Healthcare Research and Quality Working Paper No. 05009, January 2005, <http://www.ahrq.gov>.

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	0.059	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

Health Maintenance Organization (HMO):	2005	2006	2007	2008	2005-2008
Monthly premium for single coverage	321.55	342.14	363.73	398.68	355.17
Worker's contribution for single coverage	52.17	55.67	59.91	65.66	58.11
Percent worker's contribution for single coverage	16.66	16.9	16.9	16.84	16.82
Observations	646	649	597	576	2,468
Monthly premium for family coverage	885.69	933.36	998.80	1085.18	972.16
Worker's contribution for family coverage	235.33	262.14	277.23	291.16	265.53
Percent worker's contribution for family coverage	27.22	28.5	28.27	27.19	27.8
Observations	643	642	591	573	2,449
Preferred Physician Organization (PPO):	2005	2006	2007	2008	2005-2008
Monthly premium for single coverage	360.86	379.22	397.14	421.01	388.98
Worker's contribution for single coverage	57.54	61.79	65.69	68.96	63.39
Percent worker's contribution for single coverage	16.51	16.92	17.25	17	16.92
Observations	1,401	1,438	1,368	1,320	5,527
Monthly premium for family coverage	950.09	1,009.84	1,068.93	1,125.02	1,036.94
Worker's contribution for family coverage	262.89	291.77	309.48	325.04	296.82
Percent worker's contribution for family coverage	28.46	29.56	29.71	30.07	29.44
Observations	1,386	1,432	1,361	1,313	5,492
Point of Sale plan (POS):	2005	2006	2007	2008	2005-2008
Monthly premium for single coverage	345.95	360.59	391.43	413.2	376.23
Worker's contribution for single coverage	62.42	61.40	63.34	74.89	65.21
Percent worker's contribution for single coverage	17.93	17.35	16.35	18.5	17.52
Observations	456	431	421	383	1,691
Monthly premium for family coverage	933.16	959.37	1045.18	1106.63	1007.07
Worker's contribution for family coverage	277.81	291.51	323.08	326.24	303.54
Percent worker's contribution for family coverage	30.35	30.91	31.48	30.15	30.73
Observations	451	426	415	380	1,672

Table 4: Summary statistics

	Mean	Std. Dev.	Observations
Worker's monthly contribution: single PPO plan	78.57	64.39	1,666
Worker's monthly contribution: single HMO plan	57.47	48.9	1,666
Worker's monthly contribution: family PPO plan	314.58	230.83	1,662
Worker's monthly contribution: family HMO plan	255.59	179.73	1,662
Employee's premium share: single PPO plan	0.196	0.145	1,666
Employee's premium share: single HMO plan	0.169	0.14	1,666
Employee's premium share: family PPO plan	0.283	0.185	1,662
Employee's premium share: family HMO plan	0.269	0.183	1,662
Monthly premium for single PPO plan	406.26	113.36	1,666
Monthly premium for single HMO plan	349.25	91.88	1,666
Monthly premium for family PPO plan	1,110	293.22	1,662
Monthly premium for family HMO plan	964.66	231.9	1,662
Total employment*	6,988.43	18,812	1,666
Percent employee's low income (<\$25,000)	13.14	17.28	1,666
Urban location indicator	0.95	0.219	1,666
Union indicator	0.492	0.5	1,666
Wait period before qualifying for insurance (months)	1.463	1.505	1,666
Part time workers eligible for insurance indicator	0.579	0.494	1,666
Temporary workers eligible for insurance indicator	0.087	0.282	1,666
Northeast region indicator	0.245	0.431	1,666
Midwest region indicator	0.457	0.84	1,666
West region indication	0.211	0.408	1,666
Annual deductible single PPO	288.05	356.01	1,666
Annual deductible family PPO	611.72	749.72	1,662
Self insure dummy PPO	0.604	0.489	1,666
Office visit co-pay PPO	14.66	8.95	1,666
Office visit coinsurance rate PPO	3.021	6.941	1,666
Hospital visit co-pay PPO	64.84	143.35	1,458
Hospital visit coinsurance rate PPO	7.735	9.125	1,562
Hospital visit per diem PPO	2.255	25.2	1,663
Generic drug co-pay PPO	9.146	4.919	1,578
Generic drug coinsurance rate PPO	2.249	6.73	1,568
Annual deductible single HMO	60.5	211.46	1,666
Annual deductible family HMO	123.93	443.77	1,662
Self insure dummy HMO	0.336	0.472	1,666
Office visit co-pay HMO	15.58	6.563	1,666
Office visit coinsurance rate HMO	0.351	2.396	1,666
Hospital visit co-pay HMO	98.81	161.93	1,527
Hospital visit coinsurance rate HMO	2.112	5.772	1,460
Hospital visit per diem HMO	7.245	43.39	1,665
Generic drug co-pay HMO	9.529	4.168	1,596
Generic drug coinsurance rate HMO	0.985	4.9	1,596

\*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	
	3	4	7	8
Monthly PPO premium	-0.019 (0.016)	-0.011 (0.016)	0.301** (0.017)	0.31** (0.019)
Monthly HMO premium	0.225** (0.019)	0.22** (0.019)	-0.03 (0.021)	-0.028 (0.022)
Log total employment	-9.02*** (2.737)	-9.841** (2.834)	-15.33** (2.285)	-7.91* (3.99)
Percent employees low income	1.414** (0.228)	1.401** (0.229)	1.293** (0.264)	1.396** (0.27)
Urban indicator	12.96 (21.87)	9.793 (23.47)	27.45 (22.54)	36.04 (23.38)
Union indicator	-72.94** (10.18)	-61.44** (10.38)	-81.76** (12.42)	-65.82** (12.83)
Wait period for eligibility	6.368* (3.049)	5.148† (2.911)	9.405** (3.321)	8.456* (3.423)
Part time workers eligible	-2.545 (8.872)	-3.003 (8.873)	-5.204 (10.44)	-5.002 (10.41)
Temporary workers eligible	-1.823 (14.13)	9.818 (14.41)	12.16 (16.09)	9.811 (17.49)
Northeast indicator	-80.52** (13.86)	-63.59** (13.91)	-77.07** (17.75)	-77.33** (16.89)
Midwest indicator	-23.52** (7.052)	-21.16** (7.04)	-30.03* (8.191)	-26.11** (8.5)
West indicator	-59.82** (14.93)	-55.32** (15.11)	-44.22** (16.62)	-40.63** (18.6)
Annual deductible		-0.024** (0.0088)		-0.0093 (0.062)
Self-insured indicator		-6.893 (9.562)		-56.08** (13.28)
Office visit co-pay		1.46** (0.732)		-0.355 (0.722)
Office visit coinsurance		1.703 (1.68)		-1.656† (0.881)
Hospital co-pay		0.034 (0.025)		0.045 (0.031)
Hospital coinsurance		2.06** (0.788)		0.504 (0.54)
Hospital per diem		0.26** (0.073)		-0.0033 (0.122)
Generic drug co-pay		4.669** (1.06)		2.075† (1.118)
Generic drug coinsurance		2.079* (0.908)		0.23 (0.809)
Log likelihood	-10048.13	-9602.62	-10443.93	-9828.69
Observations	1,662	1,585	1,662	1,555
Firms	929	904	929	897

All models include year and industry indicators.

Table 6: Employee's contribution for single plans

	Contribution to HMO Plan		Contribution to PPO Plan	
	1	2	3	4
Monthly PPO premium	-0.062** (0.014)	-0.062** (0.014)	0.236** (0.017)	0.236** (0.017)
Monthly HMO premium	0.16** (0.016)	0.155** (0.016)	-0.042* (0.019)	-0.042* (0.019))
Log total employment	3.055* (0.93)	3.034** (0.986)	0.782 (0.125)	1.215 (1.261)
Percent employees low income	0.442** (0.074)	0.453** (0.076)	0.373** (0.086)	0.391** (0.093)
Urban indicator	0.105 (7.436)	-1.22 (7.895)	18.6* (9.14)	15.74 (9.858)
Union indicator	-21.63** (3.394)	-19.609** (3.519)	-21.67** (4.114)	-19.47** (4.349)
Wait period for eligibility	-0.105 (0.961)	-0.635 (0.98)	1.678 (1.242)	1.319 (1.186)
Part time workers eligible	4.672 (2.923)	4.123 (2.972)	2.337 (3.448)	3.027 (3.6)
Temporary workers eligible	-8.01† (4.799)	-7.312 (4.881)	-10.03† (5.577)	-8.462 (6.0)
Northeast indicator	5.308 (4.487)	8.046† (4.59)	8.206 (5.521)	11.286† (5.842)
Midwest indicator	2.959 (2.409)	2.645 (2.368)	-1.563 (2.917)	-1.635 (3.026)
West indicator	-16.1** (4.753)	-15.328** (4.785)	-15.52** (6.114)	-13.67* (6.223)
Annual deductible		0.0018 (0.0065)		0.0064 (0.0049)
Self-insured indicator		1.82 (3.167)		0.153 (4.377)
Office visit co-pay		0.1 (0.24)		0.132 (0.251)
Office visit coinsurance		-0.277 (0.553)		-0.01 (0.301)
Hospital co-pay		0.01 (0.0079)		0.014 (0.01)
Hospital coinsurance		0.488† (0.262)		-0.0077 (0.186)
Hospital per diem		0.0091 (0.028)		-0.024 (0.057)
Generic drug co-pay		0.464 (0.348)		0.013 (0.384)
Generic drug coinsurance		0.293 (0.297)		-0.105 (0.289)
Log likelihood	-7410.72	-7081.78	-8155.96	-7701.96
Observations	1,666	1,589	1,666	1,558
Firms	931	906	931	899

All models include year and industry indicators.

Table 7: Heckman selection estimation

Panel A:	Family Coverage		Single Coverage	
	HMO	PPO	HMO	PPO
Monthly HMO premium	0.191** (0.018)	-0.078* (0.033)	0.143** (0.011)	-0.097** (0.028)
Monthly PPO premium	-0.013 (0.018)	0.347** (0.034)	-0.066** (0.011)	0.235** (0.027)
Observations	6,588	3,495	6,592	3,498
Test for independent equations	281.06 (0.00)	1.71 (0.19)	0.03 (0.86)	0.3 (0.58)
Panel B:	HMO	PPO	HMO	PPO
Monthly HMO premium	0.187** (0.018)	-0.034 (0.033)	0.143** (0.021)	0.0077 (0.0075)
Monthly PPO premium	-0.013 (0.018)	0.23** (0.038)	-0.066** (0.011)	0.093** (0.028)
Observations	7,280	7,247	7,284	7,247
Test for independent equations	320.3 (0.00)	250.11 (0.00)	0.21 (0.65)	251 (0.00)

In panel A, the selection equation dependent variable is whether the firm offers the plan being analyzed  
 In panel B, the selection equation dependent variable is whether the firm offers both an HMO and a PPO plan.

Robust standard errors are in parentheses.

Eligibility of part-time and temporary workers used as the identifying variables in the selection equation.