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Ilya Rahkovsky

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Mike Conlin
Major Professor's Signature

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Ilya Rahkovsky

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ABSTRACT

ESSAYS ON CONTRACTS IN HEALTH INSURANCE

By

Ilya Rahkovsky

The problem of private information is very acute in health insurance markets. The purchasers of insurance usually know more about their expected expenditures than the providers of insurance. Because of this asymmetry of information insurance companies have to increase premiums and often the insurers are not able to offer high quality health plans. In this dissertation, I consider two ways to deal with the negative consequences of this asymmetry: disclosure of medical information and exclusive insurance contracts. In the first chapter, I research the requirement for the employees to disclose their medical information to insurance companies. In the second chapter, I consider exclusive contracts between insurance companies and employers. These contracts restrict competition from other insurance companies and allow the exclusive insurance company to offer higher quality plans.

While many employers offer insurance plans that require disclosure of medical information to insurance companies, little research has focused on the employees' incentives associated with this disclosure decision or on the factors that influence this decision. This paper develops a model where healthier employees prefer to disclosure their medical information, whereas sicker employees do not. This separating equilibrium results in the disclosure plan having a lower premium than the non-disclosure plan (i.e. a disclosure discount). The magnitude of this discount depends on the turnover rate in the firm, the number of employees in a plan, and the waiting periods for the coverage of pre-existing conditions. Using a comprehensive survey of employers by the Robert Wood Johnson Foundation to quantify the disclosure discount and test what factors influence this discount, the paper finds that the average monthly out-of-pocket premium discounts for disclosure are $24 for single and $10 for family

coverage. The paper also finds that the turnover rate increases the magnitude of the discount, whereas the number of employees in a plan decreases it. Notably, the waiting period does not affect the discount.

Exclusive contracts between insurance companies and employers protect the status of insurance company as the only insurance provider to the employees in the firm. This protection allows cross-subsidization of insurance plans when employees in one health plan subsidize employees in another health plan. The protection also allows the insurance company to offer high quality plans that the company would not be able to offer in the absence of an exclusive contract. I use a comprehensive survey of employers by the Robert Wood Johnson Foundation to test these propositions. I find that firms with exclusive contracts offer lower premium for high quality plans and higher premiums for low quality plans, which suggest that these firms are subsidizing the high quality plans. In addition, I find that the firms with exclusive contracts are more likely to offer high quality plans.

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Chapter 1

DISCLOSURE OF MEDICAL INFORMATION IN HEALTH INSURANCE

This paper considers the decision of employees to disclosure their medical information to health insurance companies. This decision is exhibited in the choice of a plan that requires the disclosure of this information when a plan that does not require disclosure is available. The premiums of the disclosure and non-disclosure plans reflect the health status of employees who select them. Insurance companies learn the health status of the employees' enrolled in the disclosure plans sooner than the status of the employees in the non-disclosure plans.In the paper, I develop and empirically test predictions of a theoretical model that explains how health status affects the sorting of employees between disclosure and non-disclosure plans in a firm

I use the 1997 survey of employers by the Robert Wood Johnson Foundation to test the model's predictions and to estimate the discount offered for disclosure. In this survey, employers were asked about health insurance plans they offered to their employees. Some of the employers allow their employees to choose between disclosure and non-disclosure health plans. I use the data on these employers to measure the sorting of employees between plans by comparing the premium for disclosure and non-disclosure plans.

The model predicts that healthy employees disclose their medical history and unhealthy employees do not. This sorting lowers average medical expenditures of the disclosure plan relative to the non-disclosure plan, which translates into a lower premium for the disclosure plan, termed the disclosure discount. I find that insurers provide discounts for the disclosure of medical histories, and the average discount is $24 per month for single coverage and $10 for family coverage.

The model also predicts that turnover rate of employees in the firm and the waiting pe-

riod for the coverage of pre-existing conditions increase the disclosure discount, whereas the number of employees in a plan decreases it. The empirical results confirm the predictions of the theoretical model. Employees in the firms with high turnover rates expect to have a short employment duration, so that the insurance company will not have enough time to access their health status if they choose the non-disclosure plan. Hence, high turnover rates exacerbate the selection based on health status and increase the disclosure discount. Large number of employees in a plan decreases the disclosure discount because the disclosure of even a very bad health status will not change the average level expenditures of the employees in the plan and hence it will not change the premium. The waiting period for the coverage of pre-existing conditions of the disclosure plan increases the disclosure discount, because a longer waiting period decreases the attractiveness of a plan to employees.[1] Hence, long waiting period of the disclosure plan results in healthier employees choosing the disclosure plan and larger discount.

1.1 Background

Sixty percent of the US population obtain health insurance through their employer. Employer-provided health insurance is often less expensive due to greater bargaining power and lower administrative costs. Another reason for the relatively cheap employer-provided insurance is adverse selection that takes place if the decision to buy insurance is positively correlated with an individuals' private information on expected medical expenditures. For example, sicker individuals buy more insurance than healthier ones. With employer-provided insurance, this selection is less acute as insurance is bundled with the employment and subsidized by the employer.

The bundling of insurance with employment may not eliminate adverse selection in the

[1] Pre-existing conditions are medical issues that originated and required treatment before the start of the current health insurance contract. Insurers routinely exclude pre-existing medical conditions from coverage. This exclusion usually lasts for 90-150 days, but it can extend up to two years.

small firms.[2] These firms may have very good information about their employees' health status and choose to purchase insurance when they anticipate high expected medical expenditures (O'Connor, 2003). To manage this problem, insurance companies often require employees to disclose their medical history. Insurance companies then use the disclosed medical history to predict future claims and to adjust premiums (Hall, 2001; Van de Ven and Ellis, 2000; Ash et al., 2000).[3] The use of medical information produces better predictions of medical expenditures than the traditional models that use only demographic information (Crocker and Snow, 2000; Hammond and Cumming, 2003; Dodge, 2007; Van de Ven and Ellis, 2000).

Health insurance coverage can affect sorting of employees across firms as well as sorting across health plans. If an employer offers health insurance this offer reduces the turnover rate of the employees, but it also attracts less healthy employees to the firm (Gruber and Madrian, 2002). If all plans in the firm require disclosure of medical history, it can lower the cost of insurance by discouraging sick individuals from seeking employment at this firm. Glazner et al. (1995) compared medical expenditures of the firms that required disclosure with the firms that did not. They found that employees who disclose their medical histories have lower average medical claims during the first two years of coverage than employees who do not disclose, although the difference is not statistically significant.

Medical history is usually disclosed through questionnaires filled out by employees. These questionnaires may be accompanied by urine and blood tests, electrocardiograms, height, weight, and blood pressure measurements. In some cases, past medical records from primary care physicians are obtained (Dodge, 2007). Insurance companies may further clarify the answers in the questionnaires by subsequent telephone interviews. Besides being collected directly from employees, medical information can also be obtained from the Medical Information Bureau (MIB).[4] In addition, insurance companies can obtain in-

[2]Most insurers and regulators classify the firms with less than 50 employees as small.

[3]Many states regulate the ability of insurers to use medical information to set the premium for small employers (Davidoff et al., 2005; Hall, 2001; Marquis and Long, 2001).

[4]MIB is the corporation owned by insurance companies with the primary mission to detect insurance

formation on prescription drug usage from health care providers (O'Connor, 2003).

Insurance companies usually do not check the validity of information in the application at the moment of enrollment. However, if the insurance company observes a large medical claim the company may start an investigation. If the investigation reveals discrepancies between the application and the medical history obtained from other sources, the insurance company can refuse coverage of any condition misinterpreted in the application, rescind the coverage of the employee or even refuse to pay for the pending claims (O'Connor, 2003). Therefore, employees have a strong incentive to fill out the application truthfully. The appendix contains the first few pages of the medical history questionnaire. This example is indicative of the relative complexity of the questionnaire. To fill out an application correctly, an employee needs to contact his medical providers and look through his medical documents. This obstacle may discourage some employees from choosing a disclosure plan if they are given a choice of a non-disclosure plan.

The process of setting insurance premiums based on an individual's risk is called risk-adjustment. This adjustment can potentially solve the adverse selection problem, as individuals and firms with high expected medical expenditures pay higher premiums. The law prohibits insurance companies from charging individually adjusted premiums to employees enrolled in the same employer-provided plan, however in firms with few employees a disclosed health status of an individual employee may have large effect on premiums. Insurance premiums of small firms can increase by more than 100% a year (Manning, 2001) as a response to the increase of the expected medical costs.

Employees also sort across health plans within a firm. If insurance companies offer both disclosure and non-disclosure plans, it may induce healthy employees to select the disclosure plan and sick employees to select the non-disclosure plan (see Section 3). There is extensive literature discussing how employees select health plans (Royalty and Solomon, 1999; Buchmueller and Feldstein, 1997; Ellis, 1989; Feldman et al., 1989; Stromborn et al.,

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fraud.

2002). Researchers find that healthier employees sort into HMO plans and plans with less comprehensive coverage. This paper complements this literature by addressing how the requirement to disclose medical history affects an employee's choice of a health plan.

The usefulness of medical information may depend on the type of health insurance plan. There are four major types of health plans offered to employees in the data set: Indemnity Plan, Health Maintenance Organization (HMO), Point of Service Plan (POS), and Preferred Provider Organization (PPO). Indemnity Plans allow individuals to choose any medical provider and do not restrict the provision of medical services. By contrast, HMOs only allow the insured to choose providers that are in the "network" and control the amount of care given. POSes restrict the provision of care by in-network providers but do allow the use of out-of-network providers, albeit with a lower cost sharing. PPOs do not restrict the provision of care by in-network providers and allow the use of out-of-network provider with a lower cost sharing (Bundorf, 2002). HMO plans are less likely to use medical history information than non-HMO plans because HMOs often attract healthier employees and the requirement to disclose medical history is less likely to change their enrollment (Kongstvedt, 2007).

In this paper, I consider factors that influence the costs and benefits of disclosure for the employees: turnover rate, the number of employees in a plan, and waiting periods for the coverage of pre-existing conditions. Economists considered the first two factors to be a potential impediment to the offer of health insurance and to the quality-quantity of insurance offered (Cutler, 1994; Crocker and Moran, 2003). Researchers view turnover rate in the health insurance context as an indicator of the lack of attachment of employees to the firm. Healthy employees who are not attached to an employer can easily leave the firm. This fluidity makes it difficult to offer good insurance because of the potential exit of healthy employees (Crocker and Moran, 2003; Bhattacharya and Vogt, 2006).

Similar to the turnover rate, few employees in a firm is an obstacle to the health insurance offer, because managers are more likely to have private information about the health

status of the employees. Small firms have little bargaining power in negotiations with insurance companies. In addition, these firms have high administrative costs of providing insurance (Cutler, 1994). This paper adds a new perspective arguing that the turnover rate and the size of the firm can affect not only the health insurance plans offered on the firm level, but also the sorting of employees across these plans.

1.2 Model

This section presents a private information model describing how employees sort between disclosure and non-disclosure plans. The model identifies a separating equilibrium where relatively healthy employees choose to disclose and relatively sick employees choose not to disclose. This sorting results in the disclosure plan having a lower premium - a disclosure discount. The model assumes that the plans are different only across premiums, waiting periods, and disclosure requirements. In reality a health plan is a complicated product with multiple features and employees can sort between the plans across several dimensions. For example, employees may sort across high and low quality health plans.

1.2.1 Separating Equilibrium

The employee has two types of medical expenditures: the costs of pre-existing conditions θ and the costs from the future random health shocks not known to the employee. Future health shocks are assumed to have a mean of zero. θ is assumed to be drawn from distribution $G(\theta)$, which is bounded between 0 and θ_{max}. For simplicity, I assume that the employee has perfect information on θ that is not available to the insurance company.

The insurance company learns θ immediately if the employee selects the disclosure plan. If an employee chooses the non-disclosure plan, the insurance company eventually learns θ by observing the employee's medical claims. The model assumes that the insurance company has no information on θ of the employees in the non-disclosure plan prior

to the period r and the insurance company learns θ at the period r. If an employee chooses the disclosure plan he needs to obtain and properly disclose this information, which is time consuming. Thus, each employee choosing the disclosure plan incurs a fixed cost F associated with disclosure.[5]

The utility of an employee depends on the out-of-pocket medical expenditures, the fixed cost of disclosure, the insurance premium, and the value of having insurance. The out-of-pocket medical expenditures equal θ during the waiting period w_i when the insurance company does not cover preexisting conditions. After the waiting period expires the out-of-pocket medical expenditures equal zero. In the model, w_d and w_n denote the waiting periods of the disclosure and non-disclosure plans, respectively, and V denotes the certainty equivalent of insurance against random health shocks.[6]

If the employee with the expected pre-existing medical expenditures θ (i.e. type θ) selects the disclosure plan, her insurance premium is $P_d(\overline{\theta}_d, \theta, N)$. This premium depends on the average medical expenditure of the average other employees in the disclosure plan $\overline{\theta}_d$, the employee's type θ, and the number of employees in the plan N. The model assumes that the insurance company updates the premium immediately after the companies receives the information on θ.[7]

If the employee selects the non-disclosure plan, the premium prior to period r is $P_n(\overline{\theta}_n)$, which depends on the expected expenditures of the other employees who are already in the plan as well as on the expectation of medical expenditures of the new employee who would join the plan. I denote the expected medical expenditures of those who select the non-disclosure plan as $\overline{\theta}_n$. When calculating $\overline{\theta}_n$, I assume that the insurance company expects new employees in the non-disclosure plan to have medical expenditures equal the average expenditures of other employees enrolled in the non-disclosure plan. After period r the

[5] In reality F is likely to be an increasing function of θ. Allowing F to vary with θ would not change the separating equilibrium nor the models comparative statics.

[6] For simplicity, I assume that all employees value insurance coverage at least as much as the premium. The model does not consider the option of no insurance

[7] Relaxing this assumption by allowing premiums to be updated only once a year does not change the separating equilibrium nor the models comparative statics.

premium for the non-disclosure plan, $P_n(\overline{\theta}_n, \theta, N)$, also depends on the employee's type and the number of employees in the plan.

The employment contract continues into the next period with probability t and so does the insurance coverage. The utility level associated with not being employed at the company is normalized to zero. The model assumes that the premium is equal to the expected average expenditures of the employees in the plan. When the insurance company learns about the employee's type (immediately in the disclosure plan and after period r in the non-disclosure plan), the company updates the premium in the following way:

$$P_i(\overline{\theta}_i, \theta, N) = \frac{N\overline{\theta}_i + \theta}{N+1}.^{8} \tag{1.1}$$

Employee θ's utility from choosing the disclosure and non-disclosure plans are presented below:

$$U_d = \sum_{i=0}^{w_d} t^i (V - \theta - P_d(\overline{\theta}_d, \theta, N)) + \sum_{j=w_d}^{\infty} t^j (V - P_d(\overline{\theta}_d, \theta, N)) - F \tag{1.2}$$

$$U_n = \sum_{i=0}^{w_n} t^i (V - \theta - P_n(\overline{\theta}_n)) + \sum_{j=w_n}^{r} t^j (V - P_n(\overline{\theta}_n)) + \sum_{k=r}^{\infty} t^k (V - P_n(\overline{\theta}_n, \theta, N)) \tag{1.3}$$

The net benefit of the disclosure plan is

$$U_d(\theta) - U_n(\theta) = \frac{t^{w_d} - t^{w_n}}{1-t}\theta - \frac{1-t^{r+1}}{1-t}\left[\frac{N\overline{\theta}_d + \theta}{N+1} - \frac{N\overline{\theta}_n}{N}\right] - \frac{t^{r+1}}{1-t}\left[\frac{N(\overline{\theta}_d - \overline{\theta}_n)}{N+1}\right] - F. \tag{1.4}$$

This net benefit is the sum of (i) the difference in out-of-pocket expenditures due to the different waiting periods, (ii) the difference in the premiums prior to period r+1, and (iii) the difference in premiums after period r; minus the fixed cost associated with disclosure. Equation 1.4 indicates that the difference in premiums after period r does not depend on θ

[8] For model tractability, I assume that insurance company's expectation of θ if the employee selects the non-disclosure plan equals to the company's expectation of the other employees who are already in the non-disclosure plan.

because the marginal effect of θ on these premiums is the same. The difference in out-of-pocket expenditures and the difference in the premiums prior to period r+1 do vary with θ, which results in the net benefit of disclosing to be less for unhealthy employees when $w_d > w_n$.[9] Formally, the net benefits of disclosure decrease as θ increases (i.e. disclosure is more costly to unhealthy employees):

$$\frac{\partial U_d - \partial U_n}{\partial \theta} = \frac{1}{1-t}(t^{w_d} - t^{w_n} + \frac{t^{r+1}-1}{1+N}) < 0. \tag{1.5}$$

when $w_d > w_n$

The expression above indicates that the slope of the utility function of the disclosure plan with respect to θ is steeper than the one of the non-disclosure plan. Therefore, there is a single-crossing property such that relatively unhealthy types with $\theta > \hat{\theta}$ choose the non-disclosure plan and relatively healthy types with $\theta < \hat{\theta}$ choose the disclosure plan.[10] Intuitively, the marginal cost of disclosure F is the same for all θ, however the marginal benefit of disclosure – difference in premiums between non-disclosure and disclosure plans after the employee joins them – is decreasing in the θ of the employee. A necessary condition for a separating equilibrium is $0 < \hat{\theta} < \theta_{max}$. Proposition 1 states conditions on F for a separating equilibrium to exist.

Proposition 1. *$\hat{\theta}$ is an interior point*[11] *in $G(\theta)$ if:*

$$\frac{\tilde{\theta}(N+1-t^{r+1})}{(1-t)(N+1)} > F > \frac{\theta_{\max}((N+1)(t^{w_d+1} - t^{w_n+1}) + N) - N\tilde{\theta}}{(1-t)(N+1)} \tag{1.6}$$

where $\tilde{\theta}$ is the unconditional expectation of the θ, $\tilde{\theta} = E(\theta)$.

The fixed cost of disclosure (F) should be large enough for the least healthy employees ($\theta = \theta_{max}$) to choose the non-disclosure plan and small enough for the healthiest employees ($\theta = 0$) to choose the disclosure plan. The conditions in Proposition 1 are less likely to

[9] In the data w_d is on average twice as long as w_n (see Table A.3), so the model assumes that $w_d > w_n$. This assumption is not critical for the model's results because θ differentially affects premiums for the disclosure and non-disclosure plans before period r+1 even if $w_n = w_d$

[10] For simplicity I assume that there is only one crossing point between the $U_d(\theta)$ and $U_n(\theta)$

[11] Even if F=0 separating equilibrium can be sustained if $t^{w_d+1} - t^{w_n+1}$ is sufficiently large.

be satisfied if medical expenditures of the most unhealthy employees are much larger than the average (θ is highly dispersed). In this case the unhealthy employees always prefer to mix with healthier employees even though they have to disclose their bad health status.

On average the costs of the health plans equal to the average θ in the population that chooses each plan:

$$\overline{\theta}_d = E(\theta|\theta < \hat{\theta}), \quad \overline{\theta}_n = E(\theta|\theta > \hat{\theta}).^{12}$$

1.2.2 Comparative Static and Insurance Premiums

This section discusses how the expected medical expenditures of the marginal employee $\hat{\theta}$ changes with turnover rate, number of employees in a plan, and waiting periods. Also, I consider how changes in $\hat{\theta}$ affect insurance premiums. To find $\hat{\theta}$ explicitly, I would need to assume the distribution of θ.[13] Instead I determine the comparative static of $\hat{\theta}$ implicitly.

Proposition 2. *A factor that increases (decreases) the difference between the utility from the disclosure and non-disclosure plans ($U_n(\theta) - U_d(\theta)$) also increases (decreases) the difference between the premiums of the two plans ($P_n(\hat{\theta}) - P_d(\hat{\theta})$) if the factor has the minimum necessary effect on the difference of the expected average medical expenditures of the two plans. If the factor have smaller than necessary effect on the difference in expenditures than the effect of the factor on the difference in premiums is well approximated by zero.*

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[12] The expectations are on average correct. Mistakes in the expectations can result in a deviations from the normal profits. The profits are stable in the long run and these possible deviations will not change the results of the model.

[13] Medical costs in the US population are well approximated by a log-normal distribution (Cardon and Hendel, 2001; Duan, 1983; de Ven and Praag, 1981; Diehr et al., 1999). However, the researchers estimated the distribution of actual medical expenditures rather than the distribution of expected expenditures (Cutler and Reber, 1998). Furthermore, we need to know this distribution conditional on the firm. Factors like number of employees in a firm, industry, age and gender distributions have a profound effect on the distribution of medical expenditures in the firm (Ellis and Ma, 2005). Moreover, most of the distribution have expectations non-linear in $\hat{\theta}$ which makes comparative static results unclear.

Next I find how the disclosure discount changes with respect to the probability of keeping employment (t), number of employees in the plan (N), waiting period of the disclosure plan (w_d) and waiting period of the non-disclosure plan (w_n).

Proposition 3. *The turnover rate, number of employees in a plan and the waiting periods have the following effects on the disclosure discount.*[14]

i. *Probability of keeping employment decreases discount:* $(\partial P_n - \partial P_d)/\partial t < 0$.

ii. *Number of employees in a plan decreases discount:* $(\partial P_n - \partial P_d)/\partial N < 0$.

iii. *Waiting period of the disclosure plan increases discount:* $(\partial P_n - \partial P_d)/\partial w_d > 0$.

iv. *Waiting period of the non-disclosure plan decreases discount:* $(\partial P_n - \partial P_d)/\partial w_n < 0$.

The condition necessary for the comparative statics results is that the rate of change in the difference between expected medical expenditures of the two plans increases in the medical expenditures of the indifferent employee $((\frac{\partial^2 \overline{\theta}_n}{\partial \hat{\theta}^2} - \frac{\partial^2 \overline{\theta}_d}{\partial \hat{\theta}^2}) > 0)$. *The condition implies that the difference in average expenditures reaches maximum when all but the sickest employees are enrolled in the disclosure plan. This condition is very likely to be satisfied in the skewed-to-the-right distributions (log-normal, exponential) commonly assumed for medical expenditures.*

Using Propositions 1-3, I can formulate the following predictions for the separating equilibrium. The model predicts that healthy employees choose to disclose their medical information and sick employees do not, that results in a lower premium for the disclosure plan. It also predicts the increase in the number of employees in the plan, the waiting period of the non-disclosure plan, and the probability of continuation of employment (t) decrease the disclosure discount, whereas the waiting period of the disclosure plan increase

[14] The condition about the rate of change

the disclosure discount. Hence the turnover rate that is inversely related to t increases the disclosure discount.

1.3 Data

The Robert Wood Johnson Foundation conducted a survey of employers in the 48 contiguous states and the District of Columbia. This 1997 survey was based on geographical and firm size strata with random selection within each stratum. Employers were asked about the health plans they offered. In total, 22,465 establishments were included in the survey, and 14,582 of these were offering medical insurance. The basic unit of observation in the survey was the health plan. The survey collected information on 33,549 health plans, as some firms offered a selection of several options. Only 15,523 health plans had no missing variables and provided information on whether the employees had to disclose medical history. Out of these, 4,730 plans were offered by multi-plan employers and, of those, 212 plans were offered by firms that offered both disclosure and non-disclosure plans.

1.3.1 Descriptive Statistics

Before focusing on the firms that offer both disclosure and non-disclosure plans, the paper first examines characteristics of the firms that offer only one type of plan. Descriptive statistics for these firms are presented in the first two columns of Table A.1. I describe the variables that are significantly different between the firms that offer in the disclosure and non-disclosure plans. The firms that offer only disclosure plans impose stricter eligibility requirements on their employees, for instance employees have to work in the firm for a longer period of time and for more hours per week to be eligible for insurance coverage. These firms are also smaller; generally they have less employees per establishment and a smaller number of establishments.

Small firms often join together to purchase health insurance in one purchasing agree-

ment. This way small firms increase their bargaining power and reduce administrative costs. Disclosure firms are more likely to participate in a purchasing agreement than the non-disclosure firms.

Health insurance plans can be broadly divided into single-service and general plan categories. Single service plans cover just one type of medical service such as dental, optical, or long-term care services. General health plans cover a broad range of medical services such as hospital stay, doctor visits, etc. Disclosure firms offer fewer single service and general health plans, although some of the difference may be explained by the smaller size of these firms. There are some fixed administrative costs of offering health insurance plans. These costs make offering many different plans difficult for the smaller firms.

Non-disclosure firms are more likely to have an open enrollment – a period when employees can switch their plans freely. For example, if every year from May 1 to May 15 all eligible employees in a firm can freely change their health plans, that constitutes an open enrollment period of 16 days. Open enrollment increases the fluidity of the enrolled population because employees change plans more often. Also, open enrollment can exacerbate adverse selection if employees who anticipate major medical expenditures switch to a more comprehensive coverage. The difference between disclosure and non-disclosure firms in the rest of the variables is either statistically insignificant or difficult to interpret.

The firms that offer disclosure and non-disclosure plans presented in the column three of Table A.1. There are only 57 firms that offer both types of plans. These firms require their employees to work less hours and to have shorter tenure to be eligible for health insurance. The firms offering both types of plans are smaller than the other two groups, and are more likely to be involved in a purchasing agreement. These firms have more low paid, part-time and young employees, who usually have a low demand for insurance. Therefore, these firms may need to offer a low-cost disclosure plan for healthy low-wage employees, who may not purchase insurance otherwise.

1.3.2 Descriptive Regression of Equilibrium Type

There are three types of firms in the data: firms with only disclosure plans, firms with only non-disclosure plans, and firms with both types of plans. Descriptive regression underscores the important factors that determine what type of plan(s) a firm will offer. I use the multinomial logit model to assess these factors. Results are presented in the Table A.2.

Firms that offer only disclosure plans impose stricter requirements on their employees to be eligible for health insurance; employees have to work in the firm for a longer period of time and for more hours per week. However, these stricter eligibility criteria do not result in a lower insurance coverage rate. The firms obtaining insurance through purchasing agreements are less likely to obtain a disclosure plan. If many small firms join together to purchase insurance, their total number of employees is large, and thus the total distribution of their medical expenditures approaches the distribution in the US population. Insurance companies know this distribution, so they can gain less from medical information provided by the firms involved in a purchasing agreement. Similarly, the distribution of medical expenditures in the large firms is less uncertain, so there is less need to require disclosure from these firms as well.

One of the reasons to require disclosure of medical history is to use this information to adjust plan features in order to manage the health of the employees. For example, if an insurance company learns from medical histories that there are a lot of smokers in plan X, the insurance company may invest in a smoking cessation program for that plan. To justify the investment in this program the insurance company needs employees to stay in plan X for some time. If a firm has open enrollment its employees can often change plans. This makes the composition of employees enrolled in plan X unstable and the return on the investment in the smoking cessation program less certain. Therefore, if a firm has an open enrollment, disclosure of medical information is less useful for insurance companies. Results show that firms with open enrollment are less likely to have disclosure plans, supporting this conclusion.

Similar to the disclosure firms, the firms that offer both types of plans are small, offer fewer plans, and are more likely to be involved in a purchasing agreement. The employees in these firms work less hours and have lower salaries. In addition, the firms that offer both types of plans have much lower turnover rate.

1.4 Disclosure Discount

1.4.1 Data

My theoretical model considers the sorting of employees between disclosure and non-disclosure plans in a firm. The source of the discount is the lower expected medical expenditures of the disclosure plan. These lower expenditures can be alternatively transmitted to the employees through higher quality of the disclosure plan. To keep the specification simple I assumed that the lower expected expenditures result only in lower premium; I address the issue of the effect of disclosure on quality in the section on sensitivity analysis section.

It is difficult to estimate the incentive to disclose by comparing the plans in these firms because there are many unobservable firm characteristics that affect the price of insurance in these firms. For example, the health of the employees, the risk associated with work, etc. Also, it is not possible to assess how much an employee values the utility from the non-disclosure of medical history if we don't know the wage this employee would have received in a firm with a disclosure plan and in a firm with non-disclosure plan. The data lacks both individual wage employee receives from the current employer and the information about a counterfactual employment in a similar firm with different disclosure requirement. If a firm offers both plans it is easier to measure the demands for these plans because the choice of a disclosure or non-disclosure plan is not bundled with an employment in different firms.

There are 57 firms that offer both types of plans to test the model's predictions as only these firms allow to identify the price of information. These firms offer 108 unique plans, 104 of these plans offer both single and family coverage for different prices. That gives me

212 plan-price observations. The fact that only 57 firms offered both types of plans can be explained by the theory in the Proposition 1. The proposition finds the minimum difference between θ_{max} (expenditures of the sickest employee) and $\tilde{\theta}$ (mean expenditures in a firm) for a separating equilibrium to exist. Possibly, most firms in the sample have larger difference between θ_{max} and $\tilde{\theta}$ (large variance of medical expenditures) and a separating equilibrium is not possible in these firms.

Disclosure discount obtained by the employees is measured as a difference between premiums for disclosure and non-disclosure plans. I use the monthly out-of-pocket premium paid by employees as a dependent variable to measure this discount. The out-of-pocket premium is equal to the difference between the premium set by insurance companies and the premium subsidy paid by employers.[15] Each plan have two distinct premiums for family and single coverage.

I include a set of covariates to control for insurance plan quality. The main measure of insurance is the actuarial value of a plan. This value measures the share of the expected medical expenditures covered by the insurance. This variable was calculated by the designers of the survey in the following manner. First, they estimated expected medical expenditures of an employee using the demographic information and geographical location. Then, they estimated the share of the expenditures covered by insurance linking expected medical expenditures with the insurance contract information. Actuarial value is bounded between 0 and 1. For example, if an actuarial value is 0.83, then 83% of the expected medical expenditures will be covered by the insurance.

In addition, the set of covariates includes a deductable - portion of the claim that is not covered by the insurance company. I also control for the type of insurance: indemnity plan, HMO, PPO, and POS. Additionally, I include an indicator that measures if coinsurance rates were different depending on the medical services.[16] The demand for some services

[15] Insurance companies have no direct control over the out-of-pocket-premium, but they can influence it knowing how the firm subsidizes the plans. Most of the firms have some system that determines the amount of subsidy. A firm can contribute fixed dollar amount to each plan or it can pay a certain share of the premium.

[16] Coinsurance rate is the percentage of the claim an employee pays after the deductable is exceeded.

such as mental health and substance abuse is strongly correlated with high medical expenditures. Insurers try to discourage the employees who demand these services from choosing some plans, so these plans feature higher coinsurance rates for these services. For example, the coinsurance rate for mental health treatments may be 50% and the coinsurance rate for general hospital visits may be 95%.

The model considers three factors that affect the difference of premiums between disclosure and non-disclosure plans: turnover rate, number of employees in a plan, and waiting periods. Turnover rate is measured as the number of employees that left the firm last year divided by the total number of employees in the end of the year. It is highly unlikely that a new employee knows exactly how many employees there are in each health plan, so I use the total number of employees in the firm divided by the number of plans as a proxy for the employee's expectation. The waiting period is the number of days an employee needs before the coverage of pre-existing conditions starts.

Table A.3 presents descriptive statistics of the disclosure and non-disclosure plans for the firms that offer both types of plans. The disclosure plans provide slightly more insurance coverage and more choices of providers (more likely to be an indemnity plan). Coinsurance rates in the disclosure health plans are less likely to vary depending on the medical service, but they have higher deductables and longer waiting periods. Sicker individuals have stronger preferences for lower deductables, shorter waiting periods, indemnity plans, and the same coinsurance rates for all services. To find how disclosure discount changes with the respect to the number of employees in a plan, I use the total number of employees divided by the number of plans because a new employee may not know exactly how many employees enrolled in each plan.

1.4.2 Econometric Specification

Employees choose health plans based on premiums and plans' qualities. I regress plan premiums on the plan qualities and disclosure requirement to estimate the price assigned

to the disclosure of medical information.

$$premium = \beta X + \beta_1 Single \times D + \beta_2 Family \times D + u \tag{1.7}$$

The set of variables X includes firm fixed effects and the variables controlling the quality of the plan presented in the Table A.3. The Family and Single variables indicate whether the out-of-pocket premium is for single or family coverage. The variable (D) indicates if the insurer requires disclosure of medical history. Interactions of Single and Family with D measure the discount associated with the disclosure of medical history for single and family coverage respectively. Estimates of β_1 and β_2 allow me to estimate the discount obtained for the disclosure of information. To test the comparative static results of the model, interactions of the turnover rate, waiting periods, and the number of employees per plan with D are included as covariates.

1.4.3 Results

This section presents the estimates of the disclosure discount and discusses how turnover rates, waiting periods and number of employees in the plan affect the discount. Table A.4 presents the regression results for employers that offered a choice between the disclosure and non-disclosure plans. Specifications 1 and 3 have no firms fixed effects. The estimated coefficients are different from the specifications 2 and 4 that feature firm fixed effects. This difference underlines the importance of unobserved firm characteristics such as health of the employees.

I test the model's predications using specifications with firm fixed effects. I expect to see negative coefficient estimates associated with $Family \times D$ and $Single \times D$ showing that disclosure requirement decreases the premium. I find that the disclosure of medical information decreases the out-of-pocket premium by \$24.18 (69% of one s.d.) for family coverage and by \$9.74 (7% of one s.d.) for single coverage; with the family coverage

coefficient is significant at the 5% level. However using F test I cannot reject the hypothesis that both the *Family* $\times D$ and *Single* $\times D$ coefficients are equal to zero.

The model predicts that the turnover rate increases the disclosure discount, so I expect to see negative coefficient estimates associated with *Turnover* $\times D$. The coefficient estimate for turnover is -122. I find that turnover rate significantly increases the discount for disclosure by 122, supporting the model's predictions. Increasing turnover rate by one standard deviation (0.17) decreases the premium of the disclosure plan by $21 (83% of the mean premium for single coverage and 14% of the mean premium for family coverage).

According to the model prediction, the expected number of employees in a plan decreases the disclosure discount, so I expect the estimate of the *Number of employees in US* $\times D$ coefficient to be positive. The coefficient is estimated to be 1.47 and it is significant at 5% level. Increasing the number of employees per plan by one standard deviation (12.3) increases the premium of the disclosure plan by $9 (37% of the mean premium for single coverage and 6% of the mean premium for family coverage).

The model also predicts that the waiting period of the disclosure plan increases the disclosure discount; therefore I expect to see negative coefficient estimates for *Waiting period* $\times D$. However, I find that the effect of the waiting period on the disclosure discount is economically and statistically insignificant, although it has the expected negative sign.

Next, I consider the estimated coefficients of the control variables. Family coverage is predictably $114 more expensive than single coverage. I expect higher quality plans with higher actuarial value, lower deductables, shorter waiting periods, wider choice of providers (non-HMO), and same coinsurance rates for different services to have higher premium. HMO plans are estimated to be significantly cheaper than non-HMO plans, whereas other quality control variables are not significant. Number of employees enrolled in plan may reduce premium because of the lower administrative costs, however the estimated effect of the enrollment on premium is not significant suggesting that administrative costs are spread around the different plans offered by the same insurer.

1.5 Sensitivity Analysis

The paper is based on the premise that the disclosure discount is a result of the different costs of providing disclosure and non-disclosure plans. The premiums insurance companies set for the plans reflect the plans' costs, and lower costs of providing disclosure plans should translate into lower premium for employees. In reality, employees are not purchasing insurance directly from the insurance company. They use employers as an intermediary. Besides their function as an intermediary, employers also subsidize premiums of the health insurance plans. Then one may worry that employers may subsidize disclosure plans more than they do the non-disclosure plans. This would create an artificial discount that does not reflect the difference in the costs of providing the plans.

To address this potential problem I measure the disclosure discount using the total premium insurance companies charge employers rather than the out-of-pocket premium employees pay. I assume that employers subsidize plans using simple rules, for example employers may pay fifty percent of the premium or pay first $100[17]. If such simple rules are used then one would expect the disclosure discount of the total premium to be larger than or equal to the disclosure discount of the out-of-pocket premium. On the other hand, if the discount is only due to the large subsidies of the disclosure plans by employers, then one would expect to see no difference in the total premiums of the disclosure and non-disclosure plans.

Table A.5 shows the disclosure discount obtained using the total premium. The estimated disclosure discount for single coverage using total premium is $43.82 (statistically significant at 1% level), whereas the discount using the out-of-pocket premium is $24.18 (statistically significant at 1% level). The estimated disclosure discount for family coverage using total premium is $27.45, whereas the discount using out-of-pocket premium is $9.74. The disclosure discounts for family coverage are not statistically significant. These results

[17] Employers cannot subsidize insurance by more than the total premium, although some employers offer vouchers to the employees who do not purchase insurance

indicate that the discount is the result of the prices insurance companies charge, rather than the subsidies employers provide.

Another possible problem of subsidies is that the subsidies are capped at the total price of the coverage, i.e. the out-of-pocket premium cannot be less than zero even if some employers would like to subsidize the insurance more.[18] Therefore, the out-of-pocket premium is truncated at zero (52% of the out-of-pocket premium observations are equal to zero). Tobit models are usually more efficient for truncated data than the ordinary least squares (OLS) regression. The estimation of disclosure discount requires firm fixed effects, unfortunately classical tobit models cannot be estimated with fixed effects. Honore (1992) proposed a semi-parametric model for the truncated data with fixed effects. While being more efficient, this method is less robust than the OLS because it relies on the assumption of no serial correlation. The data used is a cross section clustered at a firm level. Clustered data is less likely to have serial correlation than the time-series data. Therefore the assumption of no serial correlation is reasonable.

Table A.6 presents the estimated disclosure discount using the truncated model. The estimated disclosure discount for single coverage is larger, $41.62 versus $24.18, albeit slightly less significant. The magnitude of the estimated change of the disclosure discount with respect to turnover rates is larger using truncated model ($384.75 versus $121.62), although the estimate is less statistically significant. The magnitude of the estimated change of the disclosure discount with respect to the number of employees per plan is larger and the estimate is more statistically significant using truncated models ($3.36 versus $1.47). Overall, the coefficients estimated with truncated models are larger, although less statistically significant. These results provide additional evidence supporting the model's predictions.

The primary estimation in the table A.4 lumps together family and single coverage plans. Even though the model separates the effect of disclosure on the premiums of the two types of coverage, the effect of other variables is constrained to be the same. Table

[18] Employers have a strong incentive to subsidize insurance coverage because they have to pay taxes on the wage they pay to the employees, but the subsidies of health insurance are not taxed.

A.8 presents separate estimates for single and family coverage. The disclosure discount becomes larger and more statistically significant than in the primary estimation. On the other hand, the effects of the number of employees and the turnover rate on disclosure discount are smaller and less significant.

The model assumes that the disclosure discount is transmitted to employees through a lower premium, but it could be transmitted through a better quality of a disclosure plan. Although in this case higher quality may attract less healthy employees to the disclosure plan increasing its average medical expenditures. A lower quality of the disclosure plan is also possible, in this case a disclosure discount will reflect both sorting on the disclosure requirement and different quality levels and the disclosure discount will be overstated.

My primary specification assumes that the quality of plans depends on premium, but not on the disclosure requirement. In the column 1 of the Table A.7 I present the OLS regression of premium on disclosure requirement without controlling the quality of the plans. The disclosure discount is smaller and statistically insignificant, indicating that the disclosure plans may have lower quality. In addition, the table presents the results from the SUR regression testing how disclosure requirement affects premium and quality of the plans. I find that the disclosure requirement increases waiting period and deductable (lowers the quality), while it also increases the probability of the plan being an Indemnity plan and decreases the probability of a plan being an HMO. Correlation between the error term of the equations is not very high (11% is the highest), but the Breusch-Pagan rejects the hypothesis that the equations are independent.

1.6 Conclusion

Economists have long understood that the disclosure of private information can be a key to correcting the inefficiencies of insurance markets. This paper contributes to existing economic literature addressing the issues of incentives to disclose medical information by analyzing the sorting of employees into disclosure and non-disclosure plans and considers

the factors that influence this sorting.

The theoretical model suggests that the expected employment duration affects the costs and benefits of disclosing medical information. Because in the non-disclosure plan this information is eventually disclosed, long expected employment duration makes the non-disclosure plan relatively less attractive. On the other hand, short expected duration ensures that the information will not be disclosed making the non-disclosure plan more attractive. The paper finds that a turnover rate which makes expected employment duration shorter, increases the disclosure discount.

This paper also contributes to the understanding of how the number of employees in a health plan affects the cost and benefits of disclosure. Sick employees are afraid to disclose their medical information because insurers may set premiums reflecting their high expected medical expenditures. Therefore, these employees demand a larger discount for disclosure in the cases when the employee's health status can significantly affects the premiums, such as when there are few employees in the health plan. On the other hand, in the plans with a large number of employees, the premium is minimally affected by an employee's health status, and a smaller discount is required to induce unhealthy employees to select the disclosure plan.

These findings may be useful in a discussion about the incentives to disclose private medical information to the insurance company. In recent years there has been a rapid development of new genetic screening methods enabling prediction of future disease incidence with much greater precision. This paper presents a useful model for the disclosure of genetic information that may gain prominence in the future.

Chapter 2

EXCLUSIVE CONTRACTS IN HEALTH INSURANCE

2.1 Introduction

In many firms employees are not offered high quality health insurance plans or they find these plans are too expensive to purchase.[1] The first factor is that employees with high medical expenditures tend to concentrate in these plans driving their prices up Frank et al. (2000). Second factor is that insurance companies often compete by attracting the healthiest employees to their plans that discourages insurers from offering high quality plans (Ellis, 1998). This problem imposes real costs on the employees who would have paid the costs of providing the high quality plans to themselves, but are not able to shoulder the costs of their less healthy co-workers (Cutler, 1994).

In this paper, I consider a possible alleviation of this problem though the use of exclusive contracts between insurance companies and employers. These contracts guarantee that the insurance company is the only insurance provider for the employees in the firm. I test the hypothesis that the insurers, shielded from competition by exclusive contracts, are able to offer more higher quality insurance plans for a lower price than the insurers without such contracts.

I present a theoretical model of a competition between health insurance plans offered in a firm. Exclusive contracts allow insurance companies to subsidize certain health plans. The model shows when subsidizing of the high quality plan increases the total consumer surplus. In addition, the model shows under what conditions the high quality plan cannot be offered without a subsidy; and under what conditions making the high quality plan possible

[1] High quality plans cover higher share of the medical costs, offer wider range of services, and allow to choose among many medical providers.

via subsidy increases consumer surplus. The model makes three empirical predictions about the firms with exclusive insurers. First, in these firms employees in low quality plans subsidize employees in high quality plans. Second, these firms are more likely to offer high quality plans than similar firms with non-exclusive insurers. Third, these firms will have higher insurance coverage rate.

I use the 1997 nation-wide survey of employers by the Robert Wood Johnson Foundation to test these hypotheses. The survey uniquely collected information on the exclusivity of insurance contracts as well as extensive information on the quality of the health plans offered by employers. I construct an index that measures the quality of plans to test whether the price of a unit of quality is different in the firms with and without exclusive contracts. I also test the proposition that the firms with exclusive contracts are more likely to offer high quality plans by comparing the range of the quality of plans offered in these firms.

Empirical results support the model's predictions. In the firms with exclusive contracts the price of a unit of quality is 39-42 percent lower than in the firms with no such contracts. This result indicates that the prices for high quality plans in the firms with exclusive insurers are lower. Furthermore, the quality of plans offered in the firms with exclusive contracts is more diverse indicating that these firms offer more high quality plans. These results support the previous findings that that competition between insurance companies reduces average premiums, but it also reduces the amount of benefits offered (Cutler and Reber, 1998; Bundorf, 2003).

2.2 Background

In the 1970s Chicago School economists argued that exclusive contracts are not feasible because the monopoly's profit (the most a supplier would pay for an exclusive contract) is less than the reduction in consumer surplus due to the effects of a monopoly on output and price; the review is provided by Bernheim and Whinston (1998). However, in the health insurance markets exclusive contracts can be feasible to prevent inefficient entry.

For example, there are also known negative consequence of competition driven creaming, skimping, and dumping of individuals in the health insurance market when insurance companies compete by attracting the healthiest individuals (Ellis, 1998).

I propose that exclusive contracts can increase welfare by lowering the prices of the high quality plans. Prices for the employer-provided health insurance are set at the plan level. Insurance companies are forbidden from setting different prices for individual employees enrolled in the same plan. Two factors determine the price of a plan: the plan's quality (the amount of insurance the plan provides) and the average health status of the enrolled employees.[2] High cost employees are usually concentrated in the high quality plans increasing the prices of these plans, so that some employees with medium costs choose not to buy these plans. Even more troubling is the case when the distribution of medical expenditures is highly skewed to the right, then most of the employees in the firm may be priced out of the high quality plan.[3] Then the consumer surplus of the employees who were priced out of the high quality plans is lost.

A subsidy of the high quality plan can attract healthier employees to the high quality plan and increase the total consumer surplus if the gain in the consumer surplus of the employees enrolled in the high quality plan will exceed the loss of the employees enrolled in the low quality plan. This subsidy is not possible if a competitor can enter the market because a competitor may undercut the price of the subsidizing plan.[4] Exclusive contracts designed to protect insurance companies from entry can induce them to decrease the prices of the high quality plans. The welfare effects of the subsidies provided by employers were discussed by Cutler and Reber (1998).

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[2]The health status is the risk employees incur medical expenditures and the size of these expenditures.

[3]Medical costs in the US population are well approximated by a log-normal distribution that is skewed to the right (Cardon and Hendel, 2001; Duan, 1983; de Ven and Praag, 1981; Diehr et al., 1999).

[4]Healthy and young employees have higher price elasticity of demand than older and less healthy employees (Royalty and Solomon, 1999; Stromborn et al., 2002; Buchmueller and Feldstein, 1997), therefore the entrant is likely to attract the healthiest employees in the firm. In the telephone interview a sales representative of an insurance company stated that his company demands exclusive contract because the company is afraid that the plan they offer will be adversely selected against and exclusivity allows them to have sufficient participation rate (telephone interview, June 15, 2009).

Exclusive contracts cannot completely prevent competition because an insurance contract can be dissolved at any time and exclusive clause is not legally enforceable. Exclusive contracts state that the insurance company will offer specific coverage at a specific price as long as the company remains the sole provider of insurance. I interpret an exclusive contract as a credible signal sent by employers that they are interested in an exclusive relationship with the insurance company. This signal is not cheap for the employer to send, because if the employer decides to add another insurer then the first insurer will rescind the contract, imposing the costs on employees and the employer. Overall, I expect exclusive contracts to decrease the probability of entry.

Overall economists are in favor of the competition between the insurance companies as the way to lower the price of insurance. Although some economists such as Enthoven (1993) are proposing to manage the competition between the insurance companies, because an unregulated competition between insurers may not maximize the value for consumers. Insurers may try to modify health plan offers to compete for the most healthy employees or to engage in a market segmentation that blurs the price competition. To facilitate the price competition, Enthoven (1993) proposed standardization of health plans to make the choice easier and to require employees pay full cost for the marginal increase in benefits. The downside of the competition is that it not only decreases the price of insurance, but also decreases its quality (Cutler and Reber, 1998; Bundorf, 2003). Exclusive contracts may be an alternative to competition between insurance companies when the goal of the firm is to offer high quality insurance at a reasonable price, rather than to obtain the cheapest insurance possible.

2.3 Model

2.3.1 Set Up

I consider an environment where an employer offers two health insurance plans to its employees. One plan provides basic coverage (low quality) and the other plan provides comprehensive coverage (high quality). Let θ denote the expected medical expenditures of an employee, where θ is uniformly distributed between 0 and 1. The benefits employees derive from the plans are linear functions of θ. The cost of insurance companies to provide the insurance plans is a linear function of the average θ of the employees enrolled in the plans (θ_h, θ_l). I assume that the increase in the benefit from higher quality due to the marginal increase in θ is higher than the costs associated with this increase (b>d).

$$\begin{aligned} Benefit(High) &= a + b\theta \\ Cost(High) &= c + d\theta_h \\ Benefit(Low) &= e\theta \\ Cost(Low) &= f\theta_l \end{aligned} \tag{2.1}$$

The willingness to pay for the high quality plan is an increasing function of θ. At a given price for a high quality plan, there exists a $\hat{\theta}$ such that all employees with $\theta > \hat{\theta}$ choose the high quality plan and all employees with $\theta < \hat{\theta}$ choose the low quality plan. The price of the high quality plan reflects the average expenditures of the employees in the plan in the following way:

$$P(\hat{\theta}) = c + d\,E(\theta|\theta > \hat{\theta}) = c + d(1+\hat{\theta})/2, \tag{2.2}$$

provided $0 < \hat{\theta} < 1$. If the employee with $\theta = \hat{\theta}$ is indifferent between the two plans, we

can explicitly find $\hat{\theta}$.

$$\begin{aligned} &Benefit(\hat{\theta})_H - Price(\hat{\theta})_H = Benefit(\hat{\theta})_L - Price(\hat{\theta})_L \\ &a + b\hat{\theta} - c - d(1+\hat{\theta})/2 = e\hat{\theta} - 0.5f\hat{\theta} \\ &\hat{\theta} = (c - a + d/2)/(b - e + 0.5f - 0.5d) \end{aligned} \tag{2.3}$$

2.3.2 Cross-Subsidy

Prices under exclusive contracts may be different from the prices under non-exclusive arrangements (equation 2.2) when the entry is possible. With an exclusive contract employees in the low quality plan can subsidize the employees in the high quality plan. Let S be the total amount of subsidy for all employees enrolled in the high quality plan because increase participation in it may increase consumer surplus, see next subsection. The subsidy under the exclusive contract makes the high quality plan more attractive and some employees from the low quality switch to the high quality plan. Then there will be a new employee $\hat{\theta}^e$ indifferent between the two plans with smaller expected medical expenditures that the indifferent employees without the subsidy, i.e. $\hat{\theta}^e < \hat{\theta^c}$ (see Figure B.1). The new indifferent employee is determined by:

$$a + b\hat{\theta^e} - c - d(1+\hat{\theta^e})/2 + S/(1-\hat{\theta^e}) = e\hat{\theta^e} - 0.5f\hat{\theta^e} - S/\hat{\theta^e}. \tag{2.4}$$

The subsidy also increases the price of the low quality plan by $S/\hat{\theta^e}$, and it decreases the price of the high quality plan by $S/(1-\hat{\theta^e})$ (see Figure B.1). The subsidy S may total consumer surplus if the gain of the employees in the high quality plan exceed the loss of the employees in the low quality plan though wider participation in the high quality plan.

2.3.3 Consumer Surplus

The consumer surplus from the two plans is equal to the sum of benefits minus the price employees pay:

$$CS = \int_{\hat{\theta}}^{1} (a + b\theta + S/(1-\hat{\theta})) - \int_{\hat{\theta}}^{1} (c + d\theta) + \int_{0}^{\hat{\theta}} ((e-f)\theta - S/\hat{\theta}) \tag{2.5}$$

$$CS = 0.5\hat{\theta}^2(d - b + e - f) + \hat{\theta}(c - a) + a - c + 0.5b - 0.5d$$

$$\frac{\partial CS}{\partial S} = \frac{\partial CS}{\partial \hat{\theta}} \frac{\partial \hat{\theta}}{\partial S} = (c - a + \hat{\theta}(d - b + e - f)) \frac{\partial \hat{\theta}}{\partial S} \tag{2.6}$$

Proposition 4. *There exist parameters a, b, c, d, e, f such that the firm has a separating equilibrium and the subsidy of the high quality plan increases the consumer surplus. Proof in the Appendix.*

$$(e\hat{\theta} - f\hat{\theta} - (a + b\hat{\theta} - c - d\hat{\theta}) = (Benefit(\hat{\theta})_L - Cost(\hat{\theta})_L) - (Benefit(\hat{\theta})_H - Cost(\hat{\theta})_H) < 0 \tag{2.7}$$

This result is shown on the graph B.1. The subsidy increases welfare if the difference between the benefit $\theta = \hat{\theta}$ derives from the high quality plan and the cost of providing high quality plan to the employee (R_h) exceeds the difference between benefits and costs from the low quality plan (R_l). The reason why the employee cannot obtain higher surplus from the high quality plan is that the price of the plan exceeds the costs to provide the plan to the employee $\theta = \hat{\theta}$. A firm maximizes the total consumer surplus if it subsidizes the high quality plan while $R_h > R_l$. The subsidy equalizes the difference between the cost of benefit of the employee $\hat{\theta}$ in both plans. That results in a gain in the consumer surplus, see Graph B.2.

2.3.4 Infeasibility of the High Quality Plan

Employers may not be able to offer the high quality plan without a subsidy if the price of the high quality plan is equal to the willingness to pay for it at the point that lies outside of the distribution of θ (no single crossing), see Figure B.3.

Proposition 5. *There exist parameters a, b, c, d, e and f such that the subsidy of the high quality plan increases the consumer surplus if no employee chooses the high quality plan without a subsidy. The sufficient conditions for this results are:*

$$a - c > b - d + f - e 2b - 1.5d < 2e - 1.5f \tag{2.8}$$

A subsidy of the otherwise infeasible high quality plan may increase consumer surplus if the employees with medium or low medical expenditures have sufficiently high consumer surplus from the high quality plan. The employees with high expenditures cannot pay for their own expenditures in the high quality plan - this is the root of its infeasibility. However, if a subsidy increases participation of the healthier employees they bring the average expenditures and premiums down making the high quality plan feasible. I model the subsidy as a transfer from the employees in low quality plan to the employee in the high quality plan. The subsidy has to be small enough to ensure the sufficient participation in the low quality plan.

The subsidy decreases the price of the high quality plan and increases the price of the low quality plan. In addition, the subsidy attracts healthier employees to the high quality plan that further decreases its price, see Figure B.1. The subsidy is not possible without an exclusive contract because a competitor may offer the low quality plan at a lower price and lure the healthier employees.

2.3.5 Empirical Predictions

The model makes three empirical predictions. First, the relative price of the high quality plan in the firms with exclusive contracts is lower than in the firms with non-exclusive

contracts. Second, the firms with exclusive contracts are more likely to offer high quality plans. Hence, I expect to see a larger range of quality among the plans offered in these firms. Third, an exclusive contract and subsidies it may involve increase total consumer surplus and would make insurance coverage more attractive. There will be some employees, were previously insured through the spouses, who will take up the insurance increasing the coverage rate.

2.4 Data

The Robert Wood Johnson Foundation conducted a survey of employers in the 48 contiguous states and the District of Columbia. This 1997 survey was based on geographical and firm size strata with random selection within each stratum. In the survey employers in the survey were asked about the health plans they offered. The unit of observation in the survey was a health plan. The survey asked whether a firm had an exclusive contract with an insurance company only when an employer offered more than one plan. Out of 1,693 firms (13,770 health plans) that offered more than one plan, 1,541 firms (13,132 plans) provided information whether they had an exclusive contract with their insurance company.

I dropped 108 self-insured firms (1,798 plan) as their relationship with insurance companies is not clear from the data. My analysis requires many variables that measure quality of the plans such as deductables, copayments, etc. After I dropped observations with missing control variables there are 1,604 firms (9,335 plans) remain in the sample. This sample is used for econometric analysis.

2.4.1 Firms

Table B.1 presents the descriptive statistics of the firms with exclusive and non-exclusive insurers. The table provides information on 1,235 firms that is less than 1,635 firms used in the main analysis. The discrepancy is a result of the missing firm level variables that

are presented in the descriptive statistics, although these variables are not used in the main anality. Firms with exclusive providers tend to have a slightly larger total number of employees, but a significantly smaller size of establishments than the firms with non-exclusive providers.[5] Firms with non-exclusive providers tend to have more female employees. The distributions of employees' wage, age and hours work are very similar for the firms with exclusive and non-exclusive providers. Firms with non-exclusive insurers offer a larger number of plans than the firms with non-exclusive insurer.

2.4.2 Plans

Table B.2 presents the descriptive statistics of the plan level variables for firms with and without exclusive contracts. Premium is a total monthly premium insurance companies charge the employer. Health plans offered in the firms with exclusive contracts cover slightly less services than the ones offered in the firms with non-exclusive providers. The former have longer waiting periods for the coverage of pre-existing conditions. The plans offered in the firms with exclusive providers also have higher deductables – dollar amount of the yearly claims that is not covered by the insurance company, along with higher co-payments and coinsurance rates. Copayment is a fixed dollar payment employees need to make each time they use a medical provider. Coinsurance is the percent of medical claim that is not covered by insurers. However, plans with exclusive contracts are more likely to have maximum out-of-pocket payment that protect the insured against very large claims.

There are four major types of health plans offered to employees in the data set: Indemnity Plan, Health Maintenance Organization (HMO), Point of Service Plan (POS), and Preferred Provider Organization (PPO). Indemnity Plans allow individuals to choose any medical provider and do not restrict the provision of medical services. By contrast, HMOs only allow the insured to choose providers that are in the "network" and control the amount

[5] An example of a large firm with many small establishments is chain of stores or restaurants (RiteAid, Subway).

of care given. POSes restrict the provision of care by in-network providers but do allow the use of out-of-network providers, albeit with a lower cost sharing. PPOs do not restrict the provision of care by in-network providers and allow the use of an out-of-network provider with a lower cost sharing (Bundorf, 2002). Plans offered with an exclusive contract are more likely to be Indemnity or PPO plans offering the most choice of providers and are less likely to be HMOs.

The main measure of insurance is the actuarial value of a plan. This value measures the share of the expected medical expenditures covered by the insurance. This variable was calculated by the designers of the survey in the following manner. First, they estimated expected medical expenditures of employees using the demographic information and geographical location. Then, they estimated the share of the expenditures covered by insurance linking expected medical expenditures with the insurance contract information. Actuarial value is bounded between 0 and 1. For example, if an actuarial value is 0.77, then 77% of the expected medical expenditures will be covered by the insurance. If employees did not choose plans according to their health status the actuarial value would measure the cost of providing insurance. Actuarial value is not necessarily the benefit the employees derive from the plan because each health plan have many features like the coverage of dental services or a wider choice of medical providers. The demand for these features may be different from the cost of providing these features. The actuarial values of the plans offered by exclusive and non-exclusive providers are similar. The last two lines provide descriptive statistics for the plan's quality predicted using firm fixed effects. The plans offered by exclusive providers tend to offer higher quality plans than the plans offered by non-exclusive providers for both single and family coverage.

2.5 Estimation of the Price of Quality

To estimate s of the high quality plan, one first needs to estimate the price of a unit of quality. I estimate quality by regressing the premium on the plan characteristics presented in the

Table B.2 using only the data for the firms with non-exclusive contacts.[6] The firms with exclusive contracts are omitted because the goal of the first stage is to get a good measure how quality is related to price and in the firms with exclusive contracts this relationship can be distorted by subsidies.

The premium predicted using the coefficients estimated in this regression is an index of the plan's quality. There are some unobserved firm characteristics correlated with the premium such as distribution of health expenditures in the firm, administrative costs, and prior experience. I control for the unobserved firm heterogeneity using firm fixed effects. The regression equation is presented below:

$$Premium_{jk} = \sum_{i=1}^{N} \hat{\delta} Q_{ijk} + u_k + e_{jk} \tag{2.9}$$

where u_k is a firm fixed effect. I use the coefficients estimated in the equation (2.9) to estimate the quality of plans for all firms:

$$\hat{Quality} = \sum_{i=1}^{N} \hat{\delta} Q_{ijk} \tag{2.10}$$

The model predicts that in the firms with exclusive contracts the price of high quality plans should be lower and price of low quality plans higher than in the firms without these contracts. To measure the price of a unit of quality I regress the price of the plans on the predicted quality with firm fixed effects. I use bootstrap procedure to estimate standard errors because the $\hat{Quality}$ is a generated regressor.

$$Premium_{jk} = \alpha_1 + \beta_1 \hat{Quality}_{jk} + \beta_2 \hat{Quality}_{jk} \times \text{Exclusive Provider}_k + v_k + e_{jk} \tag{2.11}$$

The coefficient β_2 shows how much the price of a unit of quality is lower in the firms with exclusive contracts. I estimate the price of a unit of quality in the firms with exclusive

[6]The omitted variables are the indicators whether a plan covers physicians, hospital use, mental health treatments, indicator of gatekeeper physician, squared coinsurance, squared copayment, squared deductable, and a third degree polynomial of actuarial value.

contracts and in the firms without such contracts. Even if I find a lower price of a unit of quality in the former firms this fact does not imply existences of subsidies. The subsidies result in a higher the price of low quality plans, but the use of the firm fixed effects prevents me from estimating the difference in the prices of low quality plans.

2.5.1 Offer of High Quality Plans

I test the propositions that the firms with exclusive contracts are more likely to offer high quality plans by comparing quality of the plans. The comparison of quality across firms is problematic because different firms are often charged different prices for the same plans (Cutler, 1994); a very good quality for one firm may be a bad quality for the other. However, if firms with exclusive contracts can offer high quality plans and the firms without these contracts cannot, then the firms with exclusive contracts should have higher range of quality of the plans they offer. The range of quality is the difference between the plans with highest and lowest quality levels.

2.6 Results

In this section, I test the hypotheses that in the firms with exclusive contracts high quality plans have lower premiums than in the firms with no such contracts. In addition, I test whether the range of quality and the coverage rate in these firms are higher than in the firms without exclusive contracts.

2.6.1 The Price of Quality

Table B.3 presents the estimated coefficients from linear regressions of price on predicted quality. The price of quality is lower in the firms with exclusive providers. In the firms with exclusive insurers the price of quality is 42 percentage points less than the price in the firms with non-exclusive insurers (coefficient is statistically significant at 5% level)

for single coverage.[7] As for the family coverage the firms with exclusive contracts have the price of quality 39 percentage points lower, although the coefficient is not statistically significant.[8]

2.6.2 The Range of Quality

In this subsection I present results from the estimation of the range of quality among the plans offered by firms. I constructed quality measures using firm fixed effects, thus the means of predicted quality are not influenced by firm characteristics. However, the number of plans a firm is likely to be positively correlated with the range of quality in a firm, although the exact nature of this relationship is difficult predict.[9]

Table B.4 presents ranges of quality offered and the coverage rates in the firms with two to five plans. Among the firms that offer two health plans, the range of quality in the firms with exclusive contracts is higher (statistically significant difference at 5% level) than in the firms with no exclusive contracts. For the single coverage the difference in the range of quality is $4.2 (23% of one s.d. for the group), and for the family coverage the difference is $9.2 (25% of one s.d. for the group). Among the firms that offer more than two plans the difference between the ranges of quality is not significant. The model in the section 3 predicts that exclusive contracts increase the range of quality only for the firms with two plans and for the single coverage plans in the firms with four plans. The effects of the exclusive contracts on the firms with more than two plans depends on the market segmentation of these plans. The difference in the coverage rate between the firms with and without exclusive contracts is insignificant.

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[7] The average price of quality is by construction 100 percentage points.

[8] The coefficient is at 10% level without bootstrap procedure.

[9] To understand the exact relationship between the range of quality and the number of plans offered in a firm one needs to model competition between multiple plans that is beyond the scope of this paper.

2.6.3 Sensitivity Analysis

Employers often pay part of the insurance premiums and generally they tend to pay higher share of premium for the high quality plans. The average payments of the employers are shown in the Table B.5. One might worry that if the employer with exclusive contracts also pay higher share of high quality plans than the employers without such contracts then our results may be driven by employers rather than by insurance companies. To test this proposition I regress the premium employers pay on the quality of the plans and the interaction of the quality with the exclusive contract. Table B.6 shows the results of this regression. The coefficients on the interaction term of plan's quality and exclusive contract is not significantly different from zero for both single and family coverage. Therefore employers with exclusive contracts do not pay significantly different share of premiums for high quality plans than the employers with no exclusive contracts. Hence our results are not driven by the subsidies employers provide.

Table B.7 shows the regression results for the firms that offer only two plans. The magnitude of the estimated coefficients is similar to the magnitude in the Table B.3. The standard errors of the estimated coefficients are expectedly larger because of the smaller sample size.

Self-Insured firms were dropped from the primary analysis because the model considered the competition between insurance companies. However, these self-insured firms are interesting because they have more control over the design of insurance then firms purchasing insurance from the market. Self-Insured firms can decrease the prices of the high quality plans without formal exclusive contract if they consider it to be beneficial. In the Table B.8 I have added self-insured firms as a separate category, to see if the price of a unit of quality in these firms is different from the firms without exclusive contracts. I find the price of a unit of quality to be slightly lower in these firms (3 percentage points), whereas the firms with exclusive contracts have the price of a unit of quality lower by 30 percentage points.

2.7 Conclusion

This paper is the first to consider exclusive contracts between employers and insurance companies. I present the model predicting the firms with exclusive contracts to have lower price of higher quality plans. Empirical results support this prediction suggesting that exclusive contracts may help employers to lower the premiums for high quality plans. I this this is very interesting that the legally unenforceable exclusive contract can significantly change the insurance premiums. Unfortunately the empirical methods I used do not allow me to find out if the low quality plans subsidize the high quality plans. I do not observe if the low quality plans are more expensive in the firms with exclusive insurers.

An indirect way to confirm the existence of subsidies is to compare insurance coverage rates of the firms. If the price of the low quality plan remains the same and the price of the high quality plan decreases, then the cheaper high quality plan attract employees to switch from the coverage of their spouses employed by the other employers increasing the coverage rate (I do not observe coverage through spouse's insurance). I find little support for this predictions. This result can be interpreted as an indirect evidence of the insurance subsidies because a more expensive low quality plans is likely to experience decrease in enrollment. Some of the employees may switch to a more attractive high quality plan, but others may just drop insurance coverage or move the coverage provided by their spouses. The drop-out of these employees can cancel the effect of the employees switching to the high quality plan from their spouses' coverage provided by the other employers.

The model also predicts firms with exclusive contracts to offer more high quality plan. I test this predicting by comparing the range of the quality of the plans offered. I find that the firms with exclusive contracts have significantly range of quality only in the firms with two plans. It is difficult to predict how exclusive contracts affect the competition between multiple plans. A more comprehensive model of such competition in health insurance is very much needed.

The effect of exclusive contract is more significant stronger for single coverage than

for family coverage. This result suggests that there may be less selection based on health status among families than among individuals. An employee may have very good information about her own health status, however the health status of family members (especially children) is less certain because there is less information accumulated about their health status. Another possible explanation is the small correlation between the health statuses of the family members. Then the family plan selection will be less based on the health status of the family members and the correlation between medical expenditures and plan's quality will be less. Hence, the effect of exclusive contract will be less pronounced in the family plans.

In this paper I broadly define when the subsidization of the high quality plan increases consumer surplus and makes it optimal for a firm to sign the exclusive contract with an insurer. The question why exclusive contract increases consumer surplus for some firms and not for others requires a more specific answer. One needs to measure individual medical expenditures and demand for insurance. An effect of the subsidies on the consumer surplus of the employees in a single firm is provided by Cutler and Reber (1998). This exercise needs to be repeated for the firms with exclusive and non-exclusive contracts.

Appendix A

THE FIRST APPENDIX

A.1 Proofs

Proof of Proposition 1. First, I consider conditions necessary for $\hat{\theta} < \theta_{max}$. Due to the fact that $(\partial U_d - \partial U_n)/\partial\theta < 0$ the lower bound on on the net benefit of disclosure F_{min} to sustain the separating equilibrium is when only the employees with $\theta = \theta_{max}$ choose the non-disclose plan and all employees with $\theta < \theta_{max}$ chooses the disclosure plan - $U_d(\theta_{max}, F_{min}) - U_n(\theta_{max}, F_{min}) = 0$ and $\hat{\theta} = \overline{\theta}_n = \theta_{max}$.

$$\begin{aligned} &U_d(\theta_{max}) - U_n(\theta_{max}) = \theta_{\max}((N+1)(t^{w_d+1} - t^{w_n+1}) \\ &+ (N+1)(1-t^{r+1}) + t^{r+1}N + t^{r+1} - 1) - NE(\theta) - F_{min}(1-t)(N+1) = 0 \end{aligned} \tag{A.1}$$

then $F_{min} = \dfrac{\theta_{\max}((N+1)(t^{w_d+1} - t^{w_n+1}) + N) - NE(\theta)}{F(1-t)(N+1)}$.

Next, I consider conditions necessary for $\hat{\theta} > 0$. The upper bound on the cost of disclosure F_{max} to sustain the separating equilibrium is when only the employees with $\theta = 0$ choose the non-disclose plan and all employees with $\theta > 0$ chooses the disclosure plan - $U_d(\theta = 0, F_{max}) - U_n(\theta = 0, F_{max}) = 0$ and $\hat{\theta} = \overline{\theta}_d = 0$.

$$\begin{aligned} &U_d(\theta = 0, F_{max}) - U_n(\theta = 0, F_{max}) = \\ &(N+1)(1-t^{r+1})E(\theta) + t^{r+1}NE(\theta) - F_{max}(1-t)(N+1) = 0 \end{aligned} \tag{A.2}$$

then $F_{max} = \dfrac{E(\theta)(N+1-t^{r+1})}{F(1-t)(N+1)}$.

Proof of Proposition 2. I need to show that for a factor X the sign of $\dfrac{\partial P_n - \partial P_d}{\partial X}$ is equals to the sign of $-\dfrac{\partial U_d - \partial U_n}{\partial X}$ if $\dfrac{\partial P_n - \partial P_d}{\partial X} \neq 0$. The effect of the factor X in the difference between premiums of the two plans is:

$$\frac{\partial P_n - \partial P_d}{\partial X} = \frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X} = \frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial \hat{\theta}} \times \frac{-(\partial U_d - \partial U_n)}{\partial \hat{\theta}} \times \frac{\partial U_d - \partial U_n}{\partial X} \qquad \text{(A.3)}$$

Let $D = \frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial \hat{\theta}} \times \frac{-(\partial U_d - \partial U_n)}{\partial \hat{\theta}}$, then:

$$D = \left(\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}\right) \times (-(N+1)(t^{w_d+1} - t^{w_n+1}) - N(\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}) - (\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - 1)(1 - t^{r+1})) \qquad \text{(A.4)}$$

To determine the sign of D I consider two cases: (i) $(\partial \overline{\theta}_n - \partial \hat{\theta}_d)/\partial \hat{\theta} > 0$ then:

$$-(N+1)(t^{w_d+1} - t^{w_n+1}) - N(\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}) - (\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - 1)(1 - t^{r+1}) \qquad \text{(A.5)}$$

then $D < 0$ if:

$$\frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X} < \frac{(N+1)(t^{w_d+1} - t^{w_n+1}) - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}) + (\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - 1)(1 - t^{r+1})}{N} \qquad \text{(A.6)}$$

(ii) $(\partial \overline{\theta}_n - \partial \overline{\theta}_d)/\partial \hat{\theta} < 0$ then:

$$-(N+1)(t^{w_d+1} - t^{w_n+1}) - N(\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}) - (\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - 1)(1 - t^{r+1}) \qquad \text{(A.7)}$$

then D<0 if

$$\left|\frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X}\right| > \frac{(N+1)(t^{w_d+1} - t^{w_n+1}) - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}) + (\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - 1)(1 - t^{r+1})}{N} \qquad \text{(A.8)}$$

Therefore the sufficient condition for $Sign\left(\partial P_n - \partial P_d / \partial X\right) = -Sign\left(\frac{\partial U_d - \partial U_n}{\partial X}\right)$ is:

$$\left|\frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X}\right| > \left|\frac{(N+1)(t^{w_d+1} - t^{w_n+1}) - \frac{\partial \overline{\theta}_d}{\partial \hat{\theta}}) + (\frac{\partial \overline{\theta}_n}{\partial \hat{\theta}} - 1)(1 - t^{r+1})}{N}\right|. \qquad \text{(A.9)}$$

The sign of $\frac{\partial P_n - \partial P_d}{\partial X}$ is undetermined if $\frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X}$ is small. It is not a serious problem because $\frac{\partial P_n - \partial P_d}{\partial X}$ is a product of $\frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X}$ and $\frac{\partial \hat{\theta}}{\partial X}$ (see equation A.3). Therefore, if $\frac{\partial \overline{\theta}_n - \partial \overline{\theta}_d}{\partial X}$ is small then $\frac{\partial P_n - \partial P_d}{\partial X}$ is close to zero.

Lemma 1. *I need to show that* $(\partial P_n - \partial P_d)/\partial t > 0$. *The change of the net benefit from disclosure with t is*

$$\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} = (N+1)\hat{\theta}((w_d+1)t^{w_d} - (w_n+1)t^{w_n}) + F(N+1) + (r+1)t^r(\hat{\theta} - \overline{\theta}_n) \tag{A.10}$$

Then I plug equilibrium value for F.

$$F = \frac{(N+1)(t^{w_d+1} - t^{w_n+1})\hat{\theta} + N(\overline{\theta}_n - \overline{\theta}_d) + (\overline{\theta}_n - \hat{\theta})(1 - t^{r+1})}{(1-t)(N+1)} \tag{A.11}$$

$$\begin{aligned} &\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} = \\ &\frac{(N+1)\hat{\theta}((w_d+1)t^{w_d} - (w_n+1)t^{w_n})(1-t) + (N+1)(t^{w_d+1} - t^{w_n+1})\hat{\theta}}{1-t} \\ &+ \frac{N(\overline{\theta}_n - \overline{\theta}_d) + (\overline{\theta}_n - \hat{\theta})(1 - t^{r+1}) + (r+1)t^r(\hat{\theta} - \overline{\theta}_n)(1-t)}{1-t} \end{aligned} \tag{A.12}$$

In the data all separating equilibrium firms have $(1 - t^{r+1}) - (r+1)t^r(1-t) > -0.01$, *hence I assume that* $(1 - t^{r+1}) - (r+1)t^r(1-t) > 0$

$$\begin{aligned} \frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} > &\frac{(N+1)\hat{\theta}((w_d+1)t^{w_d} - (w_n+1)t^{w_n})(1-t)}{1-t} \\ &+ \frac{(N+1)(t^{w_d+1} - t^{w_n+1})\hat{\theta} + N(\overline{\theta}_n - \overline{\theta}_d)}{1-t} \end{aligned} \tag{A.13}$$

in all separating equilibrium firms $((w_d+1)t^{w_d} - (w_n+1)t^{w_n})(1-t) + t^{w_d+1} - t^{w_n+1} > -0.5$, *therefore*

$$\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} > \frac{N(\overline{\theta}_n - \overline{\theta}_d) - 0.5(N+1)\hat{\theta}}{(1-t)} \tag{A.14}$$

If $\hat{\theta} = \theta_{max}$ *then the expression (A.19) is positive as* $N\theta_{max} > 0.5(N+1)\theta_{max}$. *If* $\hat{\theta} = 0$ *then the expression (A.19) is positive as* $N\tilde{\theta} > 0$. *I cannot sign the expression (A.19) between extreme points, however if* $N(\frac{\partial^2 \overline{\theta}_n}{\partial \hat{\theta}^2} - \frac{\partial^2 \overline{\theta}_d}{\partial \hat{\theta}^2}) > 0$ *then the expression (A.19) has minimum either at* $\hat{\theta} = \theta_{max}$ *or at* $\hat{\theta} = 0$ *and* $\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} > 0$. *Then using the proposition 2:* $(\partial P_n - \partial P_d)/\partial t > 0$.

Lemma 2. *I need to show that the difference in premiums of the two plans increases in the* $(\partial P_n - \partial P_d)/\partial N > 0$

$$\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} = (N+1)\hat{\theta}((w_d+1)t^{w_d} - (w_n+1)t^{w_n}) + F(N+1) + (r+1)t^r(\hat{\theta} - \overline{\theta}_n) \tag{A.15}$$

Then I plug equilibrium value for F:

$$F = \frac{(N+1)(t^{w_d+1} - t^{w_n+1})\hat{\theta} + N(\overline{\theta}_n - \overline{\theta}_d) + (\overline{\theta}_n - \hat{\theta})(1 - t^{r+1})}{(1-t)(N+1)} \tag{A.16}$$

$$\begin{aligned} &\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} = \\ &\frac{(N+1)\hat{\theta}((w_d+1)t^{w_d} - (w_n+1)t^{w_n})(1-t) + (N+1)(t^{w_d+1} - t^{w_n+1})\hat{\theta}}{1-t} \\ &+ \frac{N(\overline{\theta}_n - \overline{\theta}_d) + (\overline{\theta}_n - \hat{\theta})(1 - t^{r+1}) + (r+1)t^r(\hat{\theta} - \overline{\theta}_n)(1-t)}{1-t} \end{aligned} \tag{A.17}$$

In the data all separating equilibrium firms have $(1 - t^{r+1}) - (r+1)t^r(1-t) > -0.01$*, hence I assume that* $(1 - t^{r+1}) - (r+1)t^r(1-t) > 0$

$$\begin{aligned} \frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} > &\frac{(N+1)\hat{\theta}((w_d+1)t^{w_d} - (w_n+1)t^{w_n})(1-t)}{1-t} \\ &+ \frac{(N+1)(t^{w_d+1} - t^{w_n+1})\hat{\theta} + N(\overline{\theta}_n - \overline{\theta}_d)}{1-t} \end{aligned} \tag{A.18}$$

in all separating equilibrium firms $((w_d+1)t^{w_d} - (w_n+1)t^{w_n})(1-t) + t^{w_d+1} - t^{w_n+1} > -0.5$*, therefore*

$$\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} > \frac{N(\overline{\theta}_n - \overline{\theta}_d) - 0.5(N+1)\hat{\theta}}{(1-t)} \tag{A.19}$$

If $\hat{\theta} = \theta_{max}$ *then the expression (A.19) is positive as* $N\theta_{max} > 0.5(N+1)\theta_{max}$*. If* $\hat{\theta} = 0$ *then the expression (A.19) is positive as* $N\tilde{\theta} > 0$*. I cannot sign the expression (A.19) between extreme points, however if* $N(\frac{\partial^2 \overline{\theta}_n}{\partial \hat{\theta}^2} - \frac{\partial^2 \overline{\theta}_d}{\partial \hat{\theta}^2}) > 0$ *then the expression (A.19) has minimum either at* $\hat{\theta} = \theta_{max}$ *or at* $\hat{\theta} = 0$ *and* $\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial t} > 0$*. Then using the proposition 2:* $(\partial P_n - \partial P_d)/\partial N > 0$

Proof of Proposition 3. This proposition unifies comparative static predictions of the model

i. Probability of keeping employment decreases discount: $(\partial P_n - \partial P_d)/\partial t > 0$. See lemma 1.

ii. Number of employees in a plan decreases discount: $(\partial P_n - \partial P_d)/\partial N > 0$.

iii. $\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial w_d} = (N+1)\hat{\theta}t^{w_n+1} \ln t < 0$, then using proposition (2) I find that the waiting period of the disclosure plan increases discount: $(\partial P_n - \partial P_d)/\partial w_d < 0$.

iv. $\frac{\partial U_d(\hat{\theta}) - \partial U_n(\hat{\theta})}{\partial w_n} = -(N+1)\hat{\theta}t^{w_d+1} \ln t > 0$, then using proposition (2) I find that the waiting period o the non-disclosure plan decreases discount: $(\partial P_n - \partial P_d)/\partial w_n > 0$.

A.2 Tables and Figures

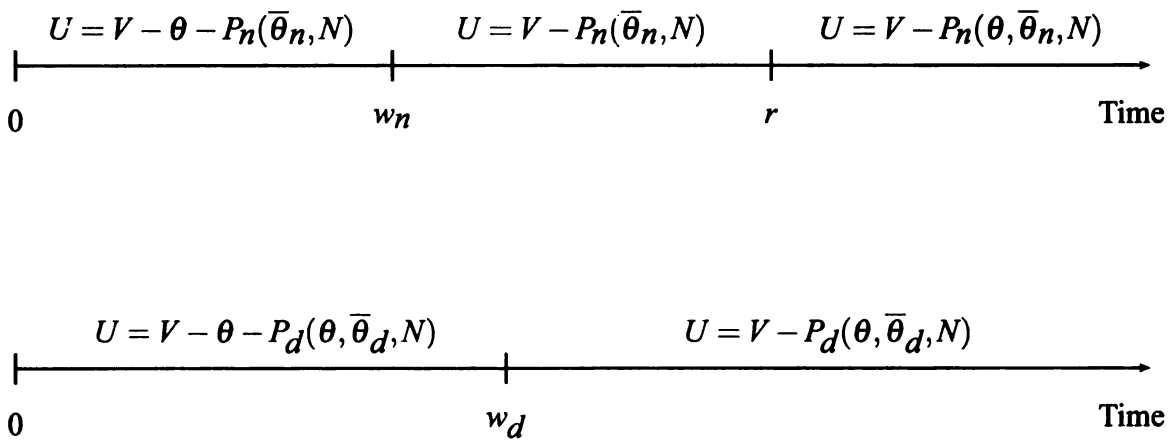

Figure A.1: Utility of the disclosure and non-disclosure plans

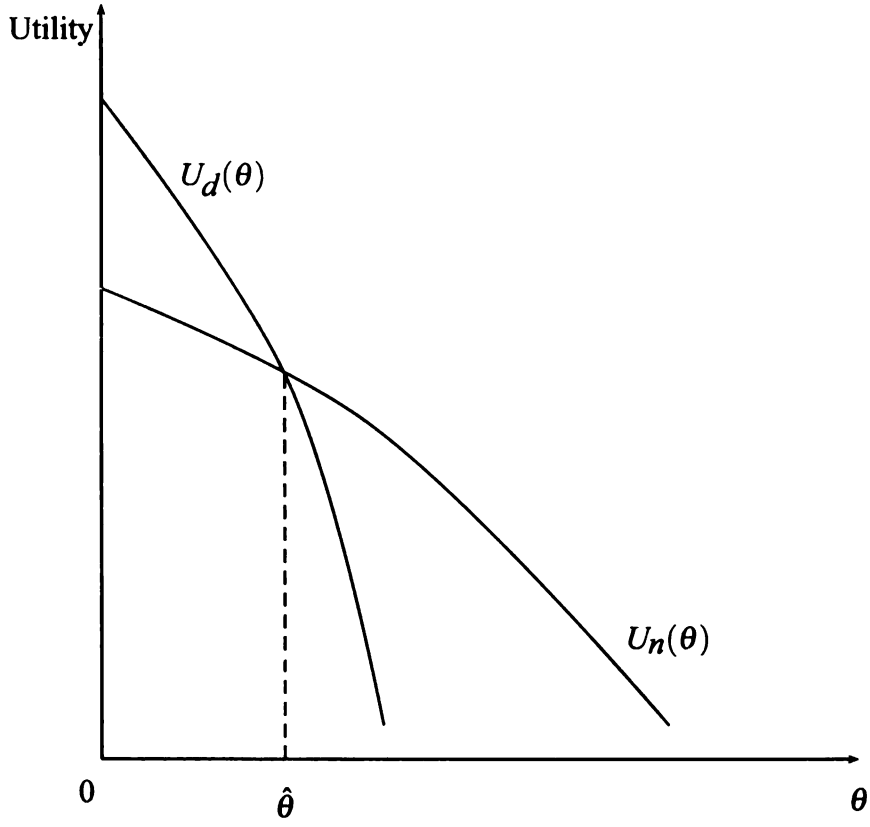

Figure A.2: Single Crossing of the Utility functions

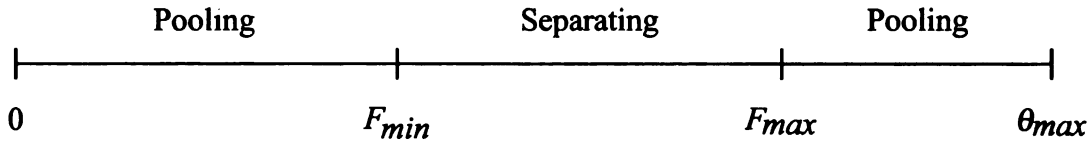

Figure A.3: Fixed costs of disclosure and equilibrium types

Table A.1: Firm Level Descriptive Variables

	Disclosure		Non-disclosure		Both	
	mean	sd	sd	mean	sd	mean
Permanent workers, %	94.04	15.13	94.52	15.08	96.92	7.87
Eligible perm. workers, %	88.49	20.66	89.68	19.14	91.25	15.35
Days work for eligibility	70.66***	76.31	64.27***	67.20	57.8	51.1
Hr/wk work for eligibility	24.66**	15.43	23.80**	14.73	20.44	15.63
Coverage rate, %	70.6	26.6	72.9	26.6	75.1	25.3
Workers at establishment	13.18***	11.71	16.17***	13.34	18.14	13.2
Number of establishments	3.18***	28.22	6.29***	45.86	1.26	0.56
Workers in the US per plan	45.32***	602.91	172.48***	1393.70	12.5	15.5
Purchasing agreement	0.31***	0.46	0.38***	0.49	0.44	0.5
N of single service plans	0.23***	0.46	0.32***	0.63	0.38	0.53
Total N of health plans	1.14***	0.52	1.43***	1.23	2.2	0.5
Single plan firm	0.91***	0.29	0.79***	0.41	0	0
Age of the firm	22.90***	22.21	25.33***	24.76	22.06	20.4
Open enrollment	0.24***	0.43	0.43***	0.50	0.37	0.49
Work 40 hr/wk or more, %	81.34	29.74	81.29	30.56	78.92	27.1
Work 35-39 hr/wk, %	8.44	21.51	9.17	23.40	6.68	17
Work 20-34 hr/wk, %	7.04	16.36	6.40	15.67	11.62	15.26
Work <20 hr/wk, %	3.19	11.43	3.15	10.94	2.82	0.96
Earn <$5/hr, %	3.11	11.95	3.05	11.77	7.64	18.67
Earn $5-7/hr, %	12.81	22.80	11.80	21.63	16.3	24.66
Earn $7-10/hr, %	22.55	25.22	21.97	24.98	21.26	22.14
Earn $10-15/hr, %	28.86	26.40	29.26	25.84	28.7	26.65
Earn >$15/hr, %	32.73	31.62	33.99	31.52	26.16	27.84
Workers under 30 y.o., %	25.28	24.02	26.24	23.43	29.18	22.55
Workers 30-39 %	30.75	24.34	31.18	23.33	30.26	23.82
Workers 40-49 y.o ,%	25.32	23.79	25.06	22.44	25.78	17.81
Workers >50 y.o., %	18.65	23.17	17.55	22.22	14.78	16.8
Female Workers, %	39.53***	30.08	41.38***	30.13	46.36	0.32
Agriculture	0.00	0.02	0.00	0.04	0	0
Construction	0.10	0.30	0.09	0.29	0.06	0.24
Mining, Manufacturing	0.14	0.35	0.14	0.34	0.18	0.39
Transport, Comm.	0.05	0.22	0.05	0.23	0.08	0.27
Wholesale	0.06	0.24	0.06	0.25	0.1	0.3
Retail	0.13	0.34	0.12	0.33	0.06	0.24
Financial Service	0.21*	0.41	0.19*	0.39	0.2	0.4
Professional Service	0.25***	0.43	0.29***	0.45	0.26	0.44
Other Service	0.05	0.22	0.05	0.22	0.06	0.24
Turnover rate	0.18	0.34	0.18	0.32	0.13	0.18
N	3348		2982		57	

The unit of observation is a firm. Numbers in the brackets are the standard errors. *, ** and *** indicate statistical significant difference between means at the 10, 5 and 1 percent level in a two-tail test.

Table A.2: Probability of offering only disclosure plans

	Both Disc. and Non-Disc.	Only Disclosure
Permanent employees,%	-0.1	-0.2
	(1.2)	(0.2)
Eligible permanent workers	0.005	-0.003*
	(0.010)	(0.002)
Days work for eligibility	-0.002	0.001**
	(0.002)	(0.000)
Hr/wk work for eligibility	-0.010	0.006***
	(0.010)	(0.002)
Coverage rate	-0.136	0.013
	(0.150)	(0.019)
Number of Workers at establishment	-0.007	-0.013***
	(0.012)	(0.002)
Number of Locations	-0.352*	-0.001
	(0.193)	(0.002)
Workers in US per plan	0.0002	-0.0002**
	(0.002)	(0.0001)
Purchasing agreement	-0.477	-0.104*
	(0.326)	(0.058)
Number of single service plans	-0.006	-0.108**
	(0.229)	(0.052)
Total number of health plans	-0.339*	-0.174***
	(0.204)	(0.060)
One health plan offered	.	0.302**
	.	(0.123)
Age of the firm	-0.009	-0.002*
	(0.008)	(0.001)
Open enrollment	-1.094***	-0.649***
	(0.334)	(0.059)
Work 35-39 hr/wk, %	-0.298	-0.026
	(0.668)	(0.121)
Work 20-34 hr/wk, %	1.676*	0.260
	(0.882)	(0.183)
Work less than 20 hr/wk, %	-2.259	-0.124
	(2.035)	(0.268)
Earn $5-7/hr, %	-0.189	0.207
	(1.139)	(0.259)
Earn $7-10/hr, %	-1.242	0.145
	(1.127)	(0.243)
Earn $10-15/hr, %	-1.308	0.067
	(1.123)	(0.240)
Earn more than $15/hr, %	-2.206**	0.113

Continued on the next page

Table A.2 continued

	Both Disc. and Non-Disc.	Only Disclosure
	(1.107)	(0.236)
Workers 30-39 y.o, %	-0.320	0.078
	(0.799)	(0.142)
Workers 40-49 y.o, %	-0.034	0.113
	(0.867)	(0.141)
Workers more than 50 y.o., %	-0.905	0.160
	(0.893)	(0.147)
Female workers, %	-0.227	-0.040
	(0.604)	(0.104)
Agriculture	.	-0.780
	.	(0.901)
Construction	0.127	0.021
	(0.813)	(0.147)
Mining, Manufacturing	0.207	0.053
	(0.733)	(0.138)
Transport, Comm.	0.616	-0.084
	(0.864)	(0.164)
Wholesale	0.127	-0.108
	(0.820)	(0.158)
Retail	-0.834	-0.071
	(0.859)	(0.138)
Financial Service	0.354	0.061
	(0.705)	(0.132)
Professional Service	-0.122	0.199
	(0.700)	(0.129)
Turnover rate	-1.809*	-0.049
	(0.932)	(0.080)
N	6387	6387

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1 percent level in a two-tail test.

Table A.3: Descriptive Statistics of the plans in the firms with separating equilibrium

	Disc	Non-Disc
Employee's single premium, $	22.18	28.07
	(34.18)	(39.61)
Employee's family premium, $	151.38	144.09
	(145.54)	(127.66)
Actuarial Value	0.81	0.80
	(0.08)	(0.08)
Health Maintenance Organization plan	0.48	0.48
	(0.50)	(0.50)
Point of Service plan	0.06	0.06
	(0.23)	(0.23)
Preferred Provider Organization plan	0.24**	0.37**
	(0.43)	(0.48)
Indemnity Plan	0.22**	0.10**
	0.42	0.30
Coinsurance rate varies for some services	0.47**	0.33**
	(0.50)	(0.47)
Deductable, $	207.87**	120.19**
	(273.85)	(235.09)
Employees enrolled in plan in establishment	6.26	7.11
	(7.95)	(7.66)
Total number of workers per plan in US	12.4	12.3
	(14.9)	(15.2)
Turnover rate	0.12	0.13
	(0.17)	(0.18)
Waiting period, days	111.63***	62.71***
	(160.57)	(103.43)
N	108	104

Numbers in the brackets are the standard errors. *, ** and *** indicate statistical significant difference between means at the 10, 5 and 1 percent level in a two-tail test.

Table A.4: Regression of insurance premium using the firms with separating equilibrium

	(1)	(2)	(3)	(4)
Family Coverage	115.23***	114.46***	115.02***	114.8***
	(17.5)	(16.67)	(17.72)	(16.85)
Single Coverage × D	-5.33	-24.18**	12.7	-25.19
	(9.43)	(12.23)	(20.42)	(19.32)
Family Coverage × D	7.96	-9.74	24.2	-12.01
	(24.85)	(21.06)	(34.42)	(28.03)
Actuarial Value	8.81	41.63	-36.2	-26.13
	(79.72)	(145.81)	(71.66)	(134.36)
Health Maintenance Organization	-21.5	-57.89*	-22.97	-72.75**
	(27.67)	(34.06)	(26.32)	(34.75)
Point of Service	-76.45**	-25.3	-77.26**	-52.18
	(36.86)	(41.09)	(37.34)	(42.51)
Preferred Provider Organization	-3.32	-55.82	-6.64	-66.38
	(31.59)	(43.61)	(30.59)	(42.24)
Coinsurance rate varies	12.1	-31.07	17.94	-29.98
	(13.82)	(26)	(14.4)	(25.56)
Deductable	-.04	.02	-.04	.004
	(.03)	(.03)	(.03)	(.03)
Enrolled in the plan	-1.21	.53	-.88	.86
	(1.34)	(1.68)	(.98)	(1.18)
Number of employees per plan	1.05		.28	
	(.87)		(.91)	
Number of employees per plan × D			1.28	1.47**
			(.82)	(.66)
Waiting period	-.01	.02	.09	-.0004
	(.06)	(.06)	(.08)	(.09)
Waiting period x D			-.15*	-.008
			(.09)	(.09)
Turnover rate	11.12		94.14**	
	(34.33)		(46.88)	
Turnover rate × D			-176.13**	-121.62**
			(72.9)	(61.83)
N	212	212	212	212
R^2	.45	.42	.47	.44
Fixed Effects	No	Firm	No	Firm

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1 percent level in a two-tail test. Regression model also includes union indicator, age of the firm, number of workers in the location, number of locations, work hours distribution, wage distribution, worker' age distribution, percent of female workers and industry indicator. These coefficients estimated for these variables are no shown in the table. Omitted categories include: Indemnity plan type, single coverage. Standard errors are robust to heteroscedasticity and county-cluster serial correlation. R^2 presented within each county.

Table A.5: Regression of Total Insurance Premium

	(1)	(2)
Family Coverage	252.26***	252.92***
	(16.86)	(17.01)
Single Coverage × D	-43.82***	-66.38***
	(16.56)	(24.32)
Family Coverage × D	-27.45	-51.43
	(27.92)	(33.91)
Actuarial Value	-232.89	-282.63*
	(159.07)	(159.06)
Health Maintenance Organization	-135.83***	-156.32***
	(43.16)	(38.93)
Point of Service	-31.82	-62.19
	(59.89)	(58.69)
Preferred Provider Organization	-93.29**	-106.97***
	(44.37)	(41.45)
Coinsurance rate varies	-37.59	-36.45
	(32.95)	(31.07)
Deductable	.02	-.004
	(.08)	(.07)
Enrolled in the plan	-.008	.24
	(2)	(1.46)
Number of employees per plan × D		1.3
		(1.3)
Waiting period	.14	-.03
	(.1)	(.14)
Waiting period × D		.2
		(.14)
Turnover rate × D		-67.49
		(82.75)
N	212	212
R^2	.75	.76
Fixed Effects	Firm	Firm

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1 percent level in a two-tail test. Regression model also includes union indicator, age of the firm, number of workers in the location, number of locations, work hours distribution, wage distribution, worker' age distribution, percent of female workers and industry indicator. These coefficients estimated for these variables are no shown in the table. Omitted categories include: Indemnity plan type, single coverage. Standard errors are robust to heteroscedasticity and county-cluster serial correlation. R^2 presented within each county.

Table A.6: Insurance Premium Estimation Using Truncated Models

	(1)	(2)
Family Coverage	215.72***	213.28***
	(23.39)	(21.69)
Single Coverage × D	-41.64*	-64.52**
	(24.53)	(32.57)
Family Coverage × D	-11.89	-35.56
	(29.49)	(38.05)
Actuarial Value	-11.77	-178.49
	(221.09)	(177.83)
Health Maintenance Organization plan	-155.41**	-264.67***
	(72.28)	(92.42)
Point of Service plan	-128.4	-233.8*
	(108.04)	(126.52)
Preferred Provider Organization Plan	-138.68*	-221.62**
	(83.93)	(96.26)
Coinsurance rate varies for some services	-59.98	-44.35
	(48.06)	(41.4)
Deductable	.008	-.18
	(.11)	(.16)
Number of employees per plan × D		3.36***
		(.96)
Waiting period	.23	.1
	(.19)	(.11)
Waiting period × D		.16
		(.16)
Turnover rate × D		-384.75
		(253.11)
N	212	212
Fixed Effects	Firm	Firm

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1 percent level in a two-tail test. Regression model also includes union indicator, age of the firm, number of workers in the location, number of locations, work hours distribution, wage distribution, worker' age distribution, percent of female workers and industry indicator. These coefficients estimated for these variables are no shown in the table. Omitted categories include: Indemnity plan type, single coverage. The truncated models with firm fixed effects are estimated using semi-parametric method by Honore (1992)

Table A.7: SUR Insurance Premium Estimation Using

	OLS	SUR
Out-of-pocket Premium		
Family Coverage	114.29***	114.49***
	(16.49)	(14.66)
Single Coverage × D	-11.29	-11.15
	(8.22)	(15.13)
Family Coverage × D	3.71	3.61
	(23.62)	(15.43)
Error Correlation with $u_{premuim}$		1
Actuarial Value		
Single Coverage × D		.008
		(.008)
Family Coverage × D		.008
		(.008)
Error Correlation with $u_{premuim}$		.092
Waiting Period		
Single Coverage × D		49.9***
		(16.33)
Family Coverage × D		50.0***
		(16.47)
Error Correlation with $u_{premuim}$		0.069
Health Maintenance Organization plan		
Single Coverage × D		-.08
		(.07)
Family Coverage × D		-.09
		(.07)
Error Correlation with $u_{premuim}$		-.118
Point of Service plan		
Single Coverage × D		.014
		(.033)
Family Coverage × D		.015
		(.033)
Error Correlation with $u_{premuim}$		-.009
Preferred Provider Organization Plan		
Single Coverage × D		-.15**
		(.063)
Family Coverage × D		-.14**
		(.063)
Error Correlation with $u_{premuim}$		.02
Coinsurance rate varies for some services		
Single Coverage × D		.1*

Continued on the next page

Table A.7 continued

	OLS	SUR
		(.06)
Family Coverage × D		-.1*
		(.06)
Error Correlation with $u_{premuim}$		-0.11
Deductable		
Single Coverage × D		108.28***
		(30.53)
Family Coverage × D		115.93***
		(30.8)
Error Correlation with $u_{premuim}$		0.07
N	212	212

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1 percent level in a two-tail test.

Table A.8: Separate Analysis of Family and Single Coverage

	(1)	(2)	(3)	(4)
Medical History	-25.6*	-48.36***	-39.34	-62.84
	(14.15)	(18.46)	(31.85)	(46.63)
Actuarial Value	-142.18	-181.83*	-336.54	-380.61
	(106.81)	(105.07)	(245.74)	(250.86)
Health Maintenance Organization	-110.6***	-127.84***	-153.36**	-174.7**
	(27.47)	(25.01)	(69.99)	(68.43)
Point of Service plan	-60.77	-87.08	-.9	-27.61
	(57.3)	(54.88)	(78.88)	(78.97)
Preferred Provider Organization	-65.15**	-76.91**	-119.26*	-132.25*
	(31.75)	(30.21)	(70.67)	(68.41)
Coinsurance rate varies	-7.43	-6.96	-70.72	-68.24
	(16.69)	(15.16)	(55.49)	(54.9)
Deductable	-.09	-.11	.12	.11
	(.08)	(.07)	(.09)	(.09)
Enrolled in the	-.61	-.44	.59	.93
	(1.28)	(.86)	(2.9)	(2.45)
Number of employees per × D		1.02		1.36
		(.79)		(1.97)
Waiting period	.14*	-.04	.17	.02
	(.08)	(.08)	(.14)	(.23)
Waiting period x D		.21**		.16
		(.09)		(.22)
Turnover rate x D		-43.12		-70.75
		(61.36)		(142.4)
N	108	108	104	104
R^2	.42	.49	.3	.32
Single coverage	X	X		
Family coverage			X	X
Fixed Effects	Firm	Firm	Firm	Firm

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1 percent level in a two-tail test. Standard errors are robust to heteroscedasticity and county-cluster serial correlation. R^2 presented within each county.

Appendix B

THE SECOND APPENDIX

Proof of Proposition 4.

$$\frac{\partial CS}{\partial S} = \frac{\partial CS}{\partial \hat{\theta}} \frac{\partial \hat{\theta}}{\partial S} = (c - a + \hat{\theta}(d - b + e - f)) \frac{\partial \hat{\theta}}{\partial S} \tag{B.1}$$

The subsidy of the high quality plan makes increases enrollment in the plan, hence $\frac{\partial \hat{\theta}}{\partial S} < 0$.

There are two Cases possible for in the separating equilibrium:

Case I:

$$\begin{aligned} a - c - 0.5d &> 0 \\ e - 0.5f - b + 0.5d &> 0 \\ e + 0.5d - 0.5f - b &> a - c - 0.5d \end{aligned} \tag{B.2}$$

The change in the consumer surplus increases in b. Maximum b subject to the constraints B.2 approach to $c - a + d - e - 0.5f$. Then:

$$\begin{aligned} \frac{\partial \hat{\theta}}{\partial S} &= (c - a + \hat{\theta}(d - b + e - f) \\ &= (c - a + \hat{\theta}(a - c - 0.5f) \\ &< (\hat{\theta} - 1)(a - c) \\ &< 0 \end{aligned} \tag{B.3}$$

If $\frac{\partial \hat{\theta}}{\partial S} < 0$ then $\frac{\partial CS}{\partial S} > 0$.

Case II

$$\begin{aligned} a - c - 0.5d &< 0 \\ e - 0.5f - b + 0.5d &< 0 \\ e + 0.5d - 0.5f - b &< a - c - 0.5d \end{aligned} \tag{B.4}$$

The change in the consumer surplus decreases in c. Minimum c subject to the constraints B.4 approaches $a-d+b-e+0.5f$. Then:

$$\begin{aligned}\frac{\partial\hat{\theta}}{\partial S} &= (c-a+\hat{\theta}(d-b+e-f) \\ &= (-d+b-e+0.5f+\hat{\theta}(d-b+e-f) \\ &< (-0.5d+b-e+0.5f+\hat{\theta}(0.5d-b+e-0.5f) \\ &< (\hat{\theta}-1)(0.5d-b+e-0.5f) \\ &< 0\end{aligned} \tag{B.5}$$

Therefore for both cases there are exists parameters a, b, c, d, e, and f such that $\frac{\partial CS}{\partial S} > 0$.

Proof of the Proposition 5. If the high quality plan is infeasible then even the sickest employee would choose to purchase the low quality plan:

$$\begin{aligned}a+b-c-0.5d &< e-0.5f \\ e-0.5f &> 0\end{aligned} \tag{B.6}$$

The difference in the total consumer surplus if both plans are offered versus only low quality plan is:

$$\begin{aligned}\Delta CS &= CS(\text{two plans}) - CS(\text{one plan}) \\ &= 0.5\hat{\theta}^2(d-b+e-f)+\hat{\theta}(c-a)+a-c+0.5b-0.5d-0.5e+0.5f \\ &= (1-\hat{\theta})(a-c)+0.5(1-\hat{\theta}^2)(b-d+f-e)\end{aligned} \tag{B.7}$$

ΔCS is positive if

$$a-c > b-d+f-e \tag{B.8}$$

Plugging constraint leads to the following constraints:

$$a-c > b-d+f-e 2b-1.5d < 2e-1.5f \tag{B.9}$$

There exist parameters that satisfy constraints above if (a - c) is sufficiently larger than then (b - d). For example the values a = 0.5, c = 0.1, d = 0.1, d = 0.3, f = 0.2 and e = 0.3 will fit the constraints.

B.1 Figures and Tables

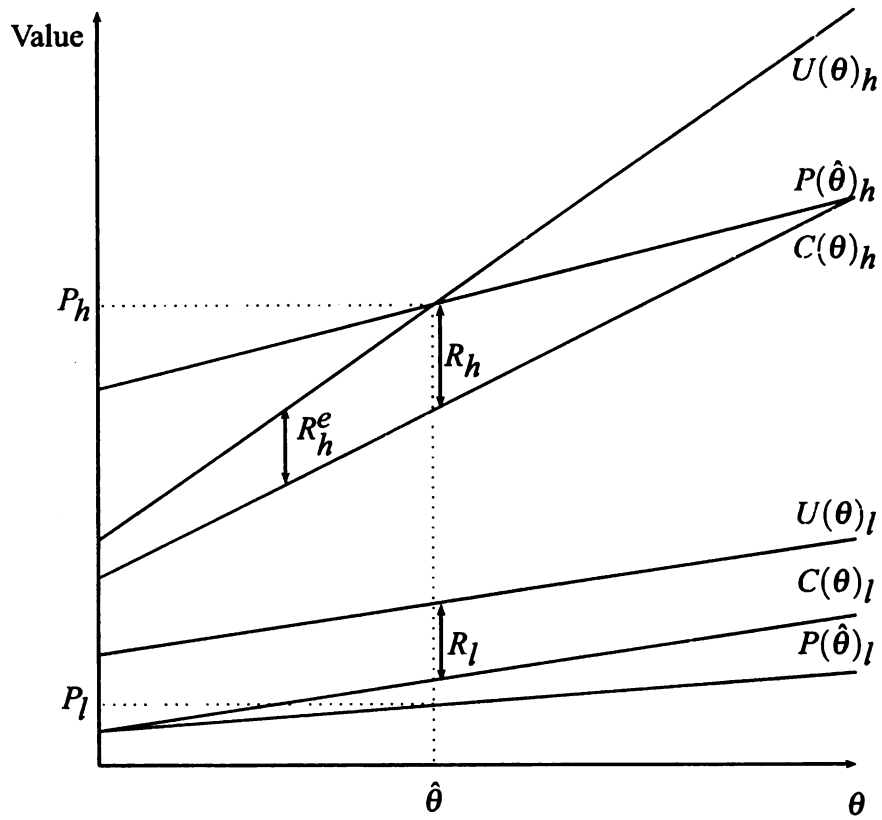

Figure B.1: Insurance Market

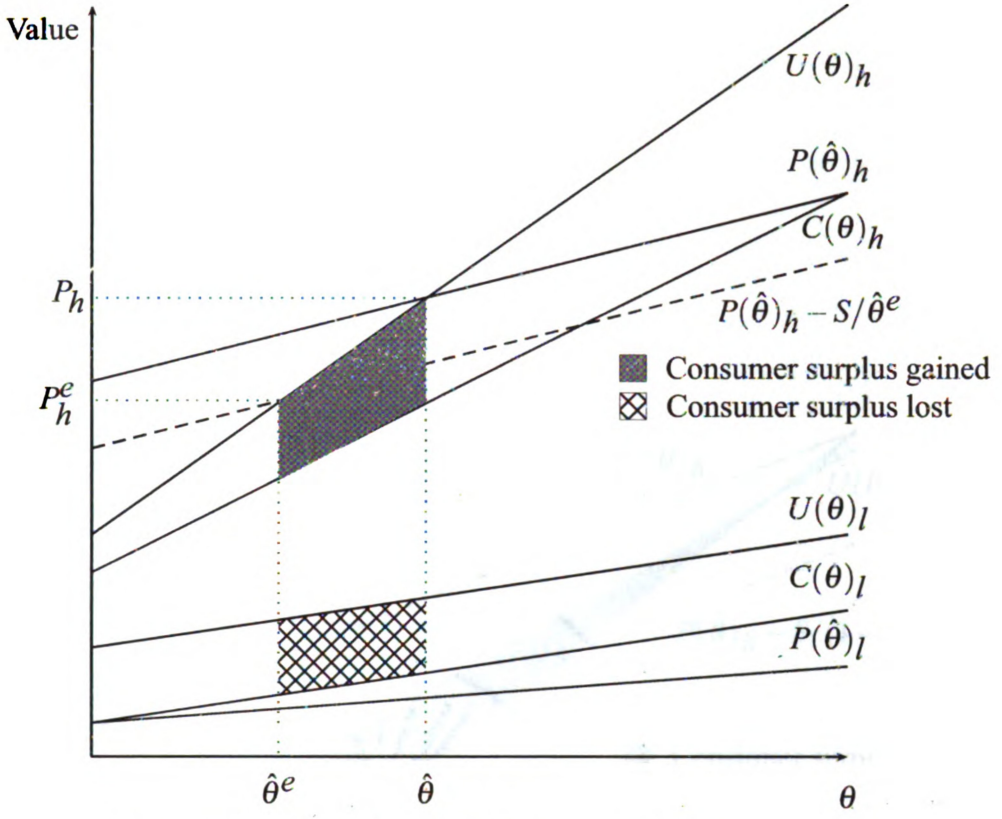

Figure B.2: Change in Total Consumer Surplus

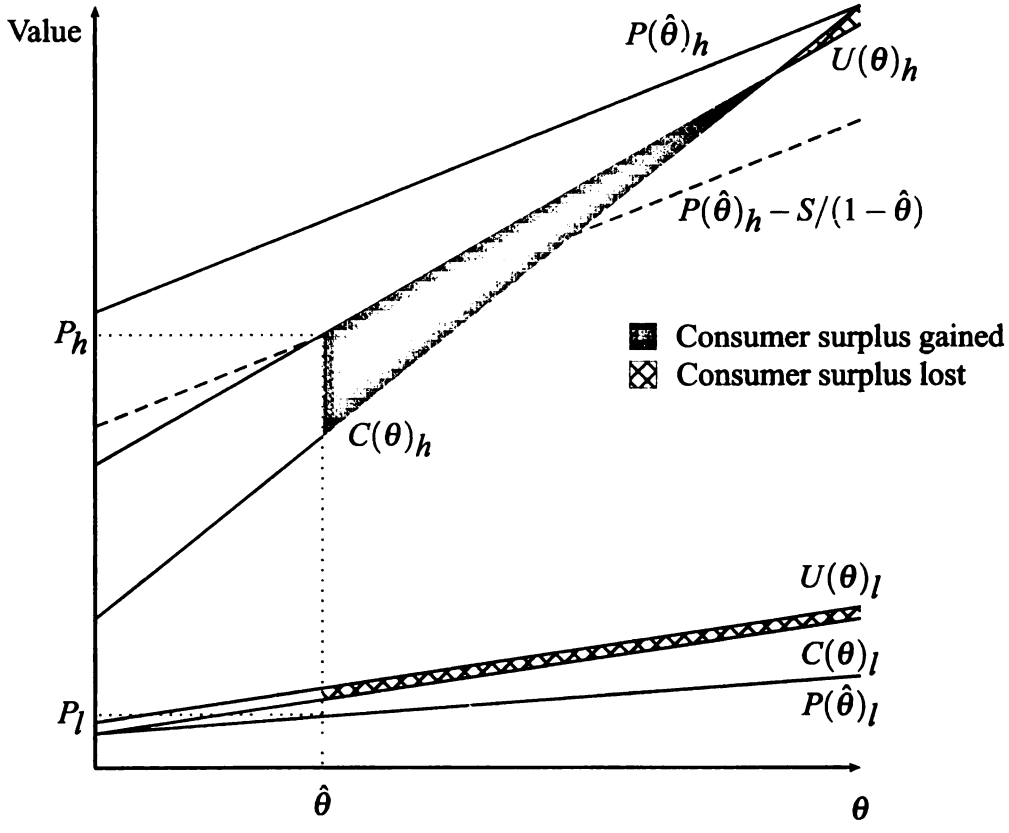

Figure B.3: Subsidy with Infeasible High Quality Plan

Table B.1: Descriptive Statistics of Firm Level Variables

	Non-Exclusive	Exclusive
Number of workers in establishment	401.15*	164.43
	(1,505.8)	(257.8)
Total number of employees nationwide	2,619.5	3,456.8
	(6,079.3)	(7,374.6)
Temporary employees, %	4.74	5.92
	(12.74)	(14.87)
Full time workers	79.13	81.99
	(31.34)	(29.55)
35-39 hr/wk workers	11.29	11.21
	(25.48)	(25.16)
20-34 hr/wk workers	6.66**	4.30
	(13.72)	(9.33)
Less than 20 hr/wk workers	2.93	2.51
	(9.57)	(10.31)
Female workers	48.53***	43.03
	(28.34)	(29.11)
Less than $5/hr workers	2.17	2.64
	(9.92)	(10.22)
$5-7/hr workers	11.07	12.01
	(20.97)	(21.63)
$7-10/hr workers	20.40	23.31
	(22.98)	(24.94)
$10-15/hr workers	28.73	29.77
	(24.38)	(27.18)
More than $15/hr workers	37.69***	32.32
	(30.99)	(29.41)
Less than 30 y.o workers	30.21	30.43
	(22.98)	(20.95)
30-39 y.o workers	29.93	30.30
	(19.94)	(18.62)
40-49 y.o workers	24.43	23.95
	(19.11)	(18.54)
More than 50 y.o. workers	15.46	15.39
	(17.77)	(18.17)
Union	0.11	0.12
	(0.32)	(0.32)
Age of the firm	40.91	41.68
	(36.98)	(38.01)
Turnover rate	0.40	0.45
	(0.63)	(0.55)
Number of plans offered	3.15***	2.7

Continued on the next page

Table B.1 continued

	OLS	SUR
	(1.8)	(1.29)
N	1,090	145

Note: *, ** and *** indicate statistically significant difference in the means.
Numbers in the brackets are standard errors of the means.

Table B.2: Descriptive Statistics of Health Plans

	Non-Exclusive	Exclusive
Premium for single coverage	165.78**	161.64
	(41.34)	(49.57)
Premium for family coverage	423.94	418.04
	(90.79)	(128.31)
Cover vision care	0.58**	0.53
	(0.49)	(0.50)
Cover dental care	0.34***	0.20
	(0.47)	(0.40)
Enrollments in the plan	677.62	332.44
	(5840.83)	(2450.12)
Active employees enrolled in plan	490.11	271.56
	(3570.34)	(1766.09)
Waiting period, days	15.86***	53.06
	(68.26)	(118.20)
Deductable	26.21***	88.11
	(97.48)	(204.89)
Copayment	7.91***	9.37
	(3.82)	(3.64)
Coinsurance rate	15.81***	18.73
	(7.65)	(7.30)
Coinsurance vary for some services	.85***	.45
	(0.36)	(0.50)
Maximum out of pocket expense	0.64***	0.72
	(0.48)	(0.45)
HMO plan	0.72***	0.65
	(0.45)	(0.48)
POS plan	0.11	0.11
	(0.31)	(0.32)
PPO Plan	0.16**	0.20
	(0.37)	(0.40)
Indemnity plan	0.01***	0.04
	(0.10)	(0.19)
Actuarial value of a plan	0.80	0.80
	0.08	0.07
N	8,922	413

Note: *, ** and *** indicate statistically significant difference in the means. Numbers in the brackets are standard errors of the means.

Table B.3: Price of Quality Estimation

	(1)	(2)
$\widehat{Quality}$	1***	1***
	(.01)	(.02)
Exclusive Provider × $\widehat{Quality}$	-.42**	-.39
	(.2)	(.29)
Const.	2.7	5.86
	(2.64)	(9.11)
R^2	.33	.21
N	9335	9316
Family		X
Single	X	

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level. Standard errors are robust to heteroscedasticity. The standard errors are estimated using bootstrap procedure with 1000 replications.

Table B.4: Means of the Range of Quality

	Range	Range	Coverage rate
Firms with two plans			
Non-Exclusive	22.3	39.2	67.6
Exclusive	26**	48.4**	70.0
N	770	770	578
Firms with three plans			
Non-Exclusive	22.8	43.3	71.3
Exclusive	18	35.2	70.1
N	394	394	293
Firms with four plans			
Non-Exclusive	23.5	45.1	70.5
Exclusive	27.8	53.2	72.4
N	197	197	151
Firms with five plans			
Non-Exclusive	23.9	49.2	73.9
Exclusive	22	42.3	73.1
N	124	124	85
Family		X	
Single	X		

Note: *, ** and *** indicate statistical significance difference between means at 10%, 5% and 1% level. Standard errors are estimated using bootstrap procedure with 1000 replications robust to heteroscedasticity.

Table B.5: Employers' Payments for Insurance

	Exclusive		Non-Exclusive	
	Share	Dollars	Share	Dollars
Single Coverage				
Low quality plans	.95	153.2	.85	134.1
Average quality plans	.83	132.5	.83	133.0
High quality plans	.85	142.4	.76	145.5
Family Coverage				
Low quality plans	.71	290.1	.73	307.6
Average quality plans	.65	270.6	.71	296.8
High quality plans	.65	295.2	.62	295.9

A plan that is less than one s.d. below the mean is denoted as low quality, a plan that is more than one s.d. above the mean is denoted as high quality.

Table B.6: Employers' Payments and Quality of Plans

	(1)	(2)
$\widehat{Quality}$	0.24***	0.13***
	(.01)	(.02)
Exclusive Provider × $\widehat{Quality}$	.09	0.18
	(.15)	(0.31)
Const.	94.85***	237.77***
	(2.36)	(8.32)
R^2	.05	.01
N	9,335	9,316
Family		X
Single	X	

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level. Standard errors are robust to heteroscedasticity. The standard errors are estimated using bootstrap procedure with 1000 replications.

Table B.7: Price of Quality for Firms with Two Plans

	(1)	(2)
$\widehat{Quality}$	1.00***	1.00***
	(.13)	(.18)
Exclusive Provider × $\widehat{Quality}$	-.31	-.55
	(.34)	(.61)
Const.	3.2	26.4
	(19.2)	(74.4)
R^2	.18	.09
N	1,259	1,245
Family		X
Single	X	

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level. Standard errors are robust to heteroscedasticity. The standard errors are estimated using bootstrap procedure with 1000 replications. In the estimation all firms with more than 2 plans were dropped.

Table B.8: Self-Insured Firms and Exclusive Contracts

	(1)	(2)
$\widehat{Quality}$	.96***	.91***
	(.02)	(.04)
Exclusive Provider × $\widehat{Quality}$	-.28*	-.30
	(.17)	(.25)
Self-Insured × $\widehat{Quality}$	-.03	-.03*
	(.02)	(.02)
Const.	8.8***	44.2**
	(2.9)	(17.8)
R^2	.28	.16
N	10,257	10,238
Family		X
Single	X	

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level. Standard errors are robust to heteroscedasticity. The standard errors are estimated using bootstrap procedure with 1000 replications.

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