Health Insurance, Expectations, and Job Turnover

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Abstract

This paper attempts to improve our understanding of why many small private employers in the US choose not to offer health insurance to their employees. We develop a theory model, simulate its predictions, and assesses whether the model helps explain empirical patterns of firm decisions to offer insurance.

Our theory model provides an explanation for why many small firms do not offer health insurance to their employees even when it may seem attractive to firms, employees and insurers to do so. Small firms have relatively large between-firm variability in expected employee health care costs, and job turnover rates for young and old employees go down differentially when firms offer health insurance. This heterogeneity and differential change in turnover rates mean that expected health costs will increase once health insurance is offered. State regulations on annual rates of premium change, or insurer reluctance to publicly increase premiums rapidly mean that coverage is only offered to small firms at high premiums, those above initial expected costs. The resulting separating equilibrium is one in which some firms face high initial premiums, choose not to offer health insurance, and tolerate higher turnover rates than if offering insurance at lower premiums were feasible. High administrative costs of offering insurance by small firms exacerbate this dynamic selection problem.

We examine the predictions of this model using data from the 1997 Robert Wood Johnson Foundation's Employer Health Insurance Survey (EHIS), which contains establishment data on employees and their offerings of health insurance. We show that turnover rates are systematically higher for in industries not offering insurance. Consistent with previous studies, the EHIS data confirm that small firms are more heterogeneous in their age distribution, income, other health-related variables than large firms. Rather than interpreting this as causing small firms to choose not to offer insurance, we see this as partial evidence in support of our theoretical model that such heterogeneity is partly the consequence of whether health insurance is offered.

We then use MEDSTAT MarketScan data from 1998-99 which has individual health care costs of 890,000 adult employees and their dependents. We develop predictive models of health care spending, and simulate distributions of firm-level expected health costs repeatedly for each firm by merging the MEDSTAT and EHIS samples by age, gender, and industry code. Small firms have a great deal of heterogeneity in expected costs. Even if employees are highly risk averse, many small firms will find it unattractive to offer insurance given with high administrative costs even when large subsidies are provided. Moreover, high turnover rates make it easy for firms to quickly change the expected costs, making it difficult for insurers to commit to constant premiums when offering insurance.

Introduction

This paper studies private employers' decisions to offer health insurance to their employees. The U.S. tax system favors health insurance obtained through employment, but many employers, especially small firms, either decide not to or are unable to take advantage of this tax shelter. We model the market imperfection that results from asymmetric information about healthcare costs between firms and insurers. Our model includes labor market dynamics as well.

The following story helps motivate our model. Consider an employer such as a restaurant or retail store, and suppose that it does not currently offer health insurance. In many such firms, wages are low and their workers have low firm-specific human capital, but the worker turnover rates tend to be high, over 70% per year. Even when the average worker in such a firm may be healthy and inexpensive to insure, both the employer and insurers know that the offering of health insurance may change this. Once workers are offered health insurance, the average health costs of the firm's employees tends to worsen. Health insurance attracts those workers who are relatively less healthy. Moreover, more healthy workers may be more mobile. So over time, less healthy workers tend to stay with the firm, while more healthy workers depart. This worsening of the risk pool is significant precisely because the turnover rates are high.

Insurers can anticipate this dynamic. Nevertheless, insurers are expected to guarantee renewals, and may have to commit to premiums three years in advance. As a result, they need to set the premium higher than current expected costs. Such a premium loading may deter the firm from offering health insurance to its workers. In other words, a dynamic adverse selection problem emerges in which employers with favorable health risks are reluctant to offer insurance at the offered premium; doing so would change the average health mix of their employees.

Our new insight is the effect of interaction in relative labor turnover dynamics and lack of premium flexibility on firms' insurance decisions. A high labor turnover may actually be preferred by some employers, especially small firms that need low job-specific human capital among their workers. These workers also tend to be more healthy. By not offering health insurance, despite the tax advantage, these firms also deter the older and less healthy workers. High administrative costs for small firms further exacerbate this dynamic selection problem. That small firms have a higher tendency to forgo health benefits to their employees is a well-documented fact, and our model provides an explanation.

The model we develop is relevant for both large and small firms. However, in small firms the selection problem is more serious because their healthcare cost distributions have higher variances, and these employers can better exploit their private knowledge.

Our stylized model generates several simple empirical hypotheses about the insurance offer decision. Firms choosing not to offer insurance need not have low variability of employee health risks within the firm (as proposed by Bundorf (2002)); instead, they may have low average expected health spending, which we operationalize as higher proportions of younger workers or workers in industries with relatively healthy workers. Industries or markets with greater heterogeneity in average age of employees across firms (rather than within firms) are more vulnerable to dynamic selection.

Our model highlights the role of expectations rather than ex post realizations. Insurance offer decisions are based on expected health care costs once insured and expected turnover rates, not actual, realized health care spending and job turnover. Empirical models using actual turnover rates introduce measurement error in this key variable; this is particularly problematic for small firms where estimates of turnover rates have higher variances. Industries with higher turnover rates among young (healthy workers) than among older (higher cost) workers will be less likely to offer insurance. Not offering insurance may persist even in relatively large firms given the dynamic selection problem in our we model.

Of interest also are the predictions about job turnovers. Selection of the type in our model is most relevant if insurance lowers job turnover, and if job turnover rates are higher in firms with young employees. Finally, the model predicts that the greater the difference in expected costs of low and high cost employees, the greater the risk that firms will choose not to offer insurance.

Our empirical analysis proceeds in five stages and uses two different data sources. We use the Robert Wood Johnson Foundation's 1997 Employer Health Insurance Survey (EHIS) and MEDSTAT's MarketScan commercially insured health claims and eligibility information. We provide an overview of our empirical analysis here.

We first use the EHIS data to examine turnover patterns and their relationship to firm and employee characteristics. The EHIS data reveal that firms are very heterogeneous; the heterogeneity concerns not only their workers' age distribution and other health-related demographic variables, but also in their job turnover rates. This diversity in job turnover rates has received little attention in the literature on the uninsured; in our dynamic model its presence exacerbates selection problems. Firms with higher proportions of young (low cost) workers have higher job turnover rates and lower insurance rates than firms with higher proportions of older (high cost) workers.

We then turn to the MEDSTAT MarketScan data from 1998-99, and use the individual health care costs of 890,000 adult employees. We develop three predictive models of health care spendings. The first one uses only demographic information; the second, disaggregated prior year spending; and the third, prior year diagnoses organized according to the Diagnostic Cost Group (DCG) Hierarchical Condition Category (DCG/HCC) system. The expected spending from each of the three predictive models is used to examine the distribution of covered medical spending and expected cost across workers. The distribution of expected costs is relevant because they, rather than ex post realized costs, matter for risk selection (Ellis and McGuire, 2004). Since the MEDSTAT data cover primarily large firms with over 1000 employees, we use the data to generate random samples of employees that match as closely as possible the industry, age categories and gender ratio of the employers appearing in the EHIS sample. By repeatedly drawing random samples of firms, we calculate the probability that each firm would have a draw of employees with such low expected healthcare costs that they would prefer not to purchase insurance at the imputed premium.

Conventional wisdom leads many policymakers and researchers to expect that pooling of employees with varying costs across small firms is feasible. Furthermore, small firms will choose to offer insurance once premiums are not much higher than the average expected costs of the pool. We show that risk pooling across firms may not work as well as conventional wisdom would suggest. This is supported by our finding that expected firm-level health care spending varies dramatically across firms. Risk pooling is inadequate to induce many small to medium size firms to purchase insurance when they have age, gender and industry distributions systematically different from the average. The threat is that adverse selection may worsen due to turnover. Our analysis explains why many firms decide not to offer insurance. Although we do not intend this model to be the sole reason for the lack of insurance in small firms, we believe that it is an important part of the overall problem.

Other researchers have studied the issues here. Excellent review articles by Blumberg and Nichols (2004), Chernew and Hirth (2004), Gruber and Madrian (2004) have already carefully documented diverse reasons why so many Americans are uninsured. There is not a single and simple explanation about why firms sometimes refuse to offer insurance and why employees refuse to accept these offers. In this paper we focus on the insights that labor market turnover and expectations may adversely affect firms' insurance offer decision.

Our paper makes many simplifying assumptions in both the theory and empirical investigations. We do not explicitly model potential improved labor productivity from healthy workers, the tax subsidy for purchasing insurance, or worker risk aversions. In healthcare cost simulations, we make the key assumption that employees are single, whereas in practice many have families, and will purchase family rather than individual coverage. The EHIS data do not include the key variable for the proportion of employees who hold family rather than individual contracts unless the firm offers insurance; as a consequence we cannot use this information in our analysis. In support of this assumption, analysis performed using MEPS data by Kate Bundorf suggest that employees of small and large firms have nearly identical proportions of single versus married employees, and single and married coverages are chosen in nearly the same proportions across firm size, so marital status does not seem to be a major determinant of employer decision to offer insurance.

A Model of Insurance and Expectations

There is a population of workers with heterogeneous healthcare cost characteristics. We normalize the total population to a mass of one. A worker randomly drawn from this population can have an expected healthcare cost either c_L or c_H, and the proportion of workers with cost c_L in the full population is $\bar{\theta}$. A worker's cost characteristic is his private information; workers are otherwise similar.

We study a dynamic model, one with potentially infinitely number of discrete periods. Suppose that in a given period, t, a firm has hired a number of workers from the marketplace. Again, each of the selected workers can be one of two types: one with a low expected healthcare cost c_L, or high expected healthcare cost c_H. We assume that the respective probabilities for the low-cost and high-cost types are θ_t and $1-\theta_t$. For a given period t, θ_t is not necessarily $\bar{\theta}$.

Each of the employed workers may leave the firm in a given period with some chance. Workers may search for jobs either actively or passively. We assume initially that a worker's departure rate depends only on his expected healthcare cost: the probability that a type c_i worker leaves the firm is λ_i, $i=L, H$, and $\lambda_L > \lambda_H$. So we assume that those workers with low expected healthcare cost are healthier and hence more mobile. Below we extend the model to the case where the departure probabilities depend on whether health insurance is offered by the firm,

So at the end of period t, a total of $\theta_t \lambda_L + (1-\theta_t) \lambda_H$ workers will leave the firm. In the following period, the firm has to replace these workers, and must hire from the general population. Because we are considering a small firm, we assume that hiring involves a random draw from the general population of workers. So for the new hires, the expected healthcare cost is simply the average cost of the population: $\bar{\theta}\, c_L + (1-\bar{\theta})c_H$. Of the workers who have continued from the previous period, $\theta_t(1-\lambda_L)$ of these are type c_L workers, while $(1-\theta_t)(1-\lambda_H)$ are type c_H workers. So the total expected cost of these continuing workers is $\theta_t(1-\lambda_L)\, c_L + (1-\theta_t)(1-\lambda_H)\, c_H$.

After the replacement workers have been hired, the expected healthcare cost of the firm is

(1) $$\left[\theta_t(1-\lambda_L)+\bar{\theta}\left[\theta_{tt}\lambda_L+(1-\theta_t)\lambda_H\right]\right]c_L+\left[(1-\theta_t)(1-\lambda_H)+(1-\bar{\theta})\left[\theta_{tt}\lambda_L+(1-\theta_t)\lambda_H\right]\right]c_H$$

This is the expected healthcare cost for the period *t+1*. We let θ_{t+1} be the share of low-cost workers at period *t+1*; the expression in (1) can then be written as $\theta_{t+1}\, c_L + (1-\theta_{t+1})\, c_H$.

In a long-run, steady state equilibrium, the healthcare cost of the firm will stay constant from period to period. Let the steady-state percentage of low-cost workers in the firm be $\hat{\boldsymbol{\theta}}$. To solve for theta, we just note that the value of (1) evaluated at $\hat{\theta}$ must be identical to $\bar{\theta}\, c_L + (1-\bar{\theta})\, c_H$. Solving this for $\hat{\theta}$ yields

(2) $$\hat{\theta}=\frac{\bar{\theta}}{\bar{\theta}+(1-\bar{\theta})\left(\dfrac{\lambda_L}{\lambda_H}\right)}<\bar{\theta}$$

where the inequality follows from $\lambda_L > \lambda_H$. In a steady state, the firm that offers health insurance will have a workforce with healthcare cost higher than the general population. The intuition is this. In each period, relatively more workers with lower healthcare costs will depart from the firm. So the average healthcare cost of those who remain must rise. The replacement workers, drawn randomly from the population, must counterbalance the cost hike. So the average cost of the workforce must be higher than the population; otherwise, the counterbalance will be ineffective.

We now examine the dynamics. From (1), and the definition of θ_{t+1}, we obtain a difference equation:

(3) $$\theta_{t+1} = [\theta_t \lambda_L + (1-\theta_t)\lambda_H]\overline{\theta} + \theta_t(1-\lambda_L)$$

We then subtract $\hat{\theta}$ on each side of this equation, collect terms and simplify. This yields the following to describe the period-to-period variation of the share of low-cost workers.

(4) $$\theta_{t+1} - \hat{\theta} = (\theta_t - \hat{\theta})[1 - \overline{\theta}\lambda_H - (1-\overline{\theta})\lambda_L]$$

Because the coefficient of $(\theta_t - \hat{\theta})$ is positive and less than 1, the system is stable. From any initial point, eventually θ_t will get close to $\hat{\theta}$, the long run tendency for the firm's proportion of low cost workers.

We have described the employment process and time-paths of a small firm facing workers with different healthcare costs and (correlated) departure rates. How is this related to the firm's insurance provision decision? More important, what sort of premiums will a firm face? If fair insurance policies are offered to the firm, the firm will find it advantageous to provide health insurance to workers because of the tax treatment and risk aversion. An insurer, however, may not know a firm's employment situation or lifecycle, and hence offering insurance at a fair premium may be infeasible. Moreover, economic theory predicts market failures when the insured have superior information than the insurer about risks (Rothschild and Stiglitz, 1976); in this case, a competitive market for insurance may fail to exist.

We do not subscribe to the complete market-failure perspective here. The insurance market may not be competitive, or the insurers may have some ways to resolve some problems due to asymmetric information. Nevertheless, we do not believe that insurers will sell actuarially fair insurance policies to firms. It is likely that market premium will carry some significant margin over the actuarially fair level.

Firms may still decide to purchase insurance when the premium is higher than the fair level. This decision depends on a host of factors such as risk aversion, transactions cost, as well as the effect of insurance on worker turnover. Our focus here is on worker turnover and its relationship with firm health insurance offering.

A firm's health insurance offer to workers may actually affect the mix of workers. We have assumed that when firms hire workers, they get those that are randomly drawn from the labor market. This is a simplifying assumption; in practice, a firm that offers health insurance attracts those workers who value insurance more. These workers may be more risk averse; they may also have private information about their health status, and more likely belong to the high-cost group. What's more, a firm's health insurance benefit may make workers less willing to leave. This effect may be stronger on those workers with higher expected healthcare costs. Both of these factors tend to drive up the premium.

On the other hand, firms may value worker continuity. Hiring and training new workers can be costly. To save hiring and training costs, firms may use health insurance to retain workers. These hiring and training costs may vary across firms. Those have high hiring and training costs may be more inclined to retain workers, and health insurance may be offered more often. Those that have low hiring and training costs may be less included to do so. So we predict that those firms with higher turnover rates will less likely offer health insurance.

Data

We use data from a variety of sources. Our primary file on firm characteristics is the Robert Wood Johnson Foundation 1997 Employer Health Insurance Survey (EHIS). This employer CAT survey has been used for similar analyses by Chu and Trapnell (2002) and others. The survey collects a rich set of information about the firm, including whether or not insurance is offered, establishment size, ten broad industry groups, and most importantly from our perspective, the proportion female and the percent of workers in each of four broad age categories. Starting from the full survey results on 41,432 employers, we excluded results from 8,710 governments, firms with no permanent full time employees, firms with missing values (mostly for income or industry type), and firms with over 5000 employees (who may have self administration and other options available to them). Our final estimation sample includes 20,585 firms. Our simulation modeling focuses on the 18,712 firms with less than 100 full-time, permanent employees.

In addition to the EHIS data, we also use a sample of 890,000 employees from the MEDSTAT MarketScan™ commercially insured population. Using the matching insurance claims for these employees, total covered charges on inpatient, outpatient and drugs in both 1998 and 1999 was summed up for the year to yield total spending. We processed the MarketScan claims data using DxCG software, which assigns to each person a vector of binary variables called “Hierarchical Condition Categories” (HCCs) which can be used to predict future health care spending based on health status (Ash, et al. 2000). The MarketScan data also contained age, gender, and aggregated industry codes for each enrollee. We used this claims data to develop distributions of expected health care spending at the firm level. First, we estimated models of covered spending for each individual in 2003 using lagged spending variable splines and HCCs. Predicted values from these models were then created for each individual in the eligibility file. We then used took random draws from this file and used it to generate 250 pseudo firms while matching on age, gender, and SIC code with the same employee characteristics of the firms in the EHIS data. We used the expected health spending at the firm level to calculate expected health spending, and the within-firm standard deviation of spending for each of the 18,712 firms in the Marketscan data with 100 or fewer employees. This approach allows us to look at within firm and between firm variability in health care spending for each industry, firm size and insurance status. This approach expands on the approach of Bundorf (2002) in that we develop estimates not only of expected health care spending but also the variability of health spending at the firm level.

Results

Summary statistics on the variables used for estimation appear in the Tables 1. As Bundorf (2002) and others have shown using earlier versions of EHIS, characteristics of firms offering health insurance differ substantially from those of firms not offering health insurance. We would particularly note that turnover rates of firms offering insurance, defined as the sum of employees arriving and employees departing the firm divided by the reported current number of employees, is 9 percentage points higher for firms not offering insurance. Firms offering and not offering insurance also differ notably in their mean age, their within-firm standard deviation of age, their mean income, and their within-firm standard deviation of income. As others have shown, the single best predictor of whether firms offer health insurance is firm size, with firm that have only one or two permanent employees having about 70 percent rates of NOT offering insurance. Figure 1 reminds us that surveys of establishments are highly skewed, with many firms having very small sizes, and a small number, accounting for many employees, having much larger sizes. Not offering insurance is highly concentrated among the large number of very small firms (Figure 2). One interesting new point is that even though industry is a significant predictor of whether firms offer insurance, even once one controls for industry there is still a strong relationship between firm size and the probability of not offering insurance (Figure 3, 4). Construction firms and retail trade firms have high rates of not offering health insurance even after controlling for firm size.

Our theory suggests that expected costs rather than the actual costs of employees should drive decision about whether to insure. Therefore we estimated four linear regression predictive models of health care spending. The first one uses only demographic information, the second uses disaggregated prior year spending with splines, and the third uses prior year diagnoses organized according to the Diagnostic Cost Group (DCG) Hierarchical Condition Category (DCG/HCC) system, and the fourth model is a “kitchen sink” model that uses all of the above information. Regression coefficients from the first and second regressions are shown in Table 2. Expected spending from each of the predictive models is used to examine not only the distribution of covered medical spending but also the distribution across workers in their expected cost. The distribution of expected rather than actual costs is relevant since it is expected costs rather than ex post realized costs that matter for risk selection (Ellis and McGuire, 2004).

Figure 5 reveals that the distribution of expected health costs is not nearly as skewed as the actual cost distribution. Also of interest is that the distribution of expected costs is nearly the same as one adds further information: Whether we use year one diagnoses to predict next years spending, or lagged spending, or both, the distribution of expected spending next year is nearly identical. For the simulations described below, we use the expected spending based on splines of lagged inpatient, outpatient and drug spending. Also included in the model were dummy variables for industry, plan type, individual age, gender, employee status (e.g. salaried or wage). The predictive model we used is shown in the second set of columns of Table 2.

Since the MEDSTAT data covers primarily large firms with over 1000 employees, we could not attempt to match the MEDSTAT and EHIS data at the firm level. Instead we use the data to generate random samples of employees that match as closely as possible the industry, age categories and gender ratio of the employers appearing in the EHIS sample. By repeatedly drawing 250 random samples of appropriate employees for each firm, we are able to calculate for each firm the probability that it would have a draw of employees sufficiently low expected health care costs that they would on average prefer not to purchase insurance at the imputed premium.

Table 3 summarizes the result of these simulations at the firm level. The distribution of expected health care spending for small firms differs notably for small firms (1-9 and 10-24 employees) and large firms of 100 or more workers. Mean expected health costs of small versus large firms differ somewhat, because of their age, gender, and industry, with small firms having health costs that are about 3 percent above the average ($1666 versus $1619), while firms with 25-49 employees average about 5 percentage points below the grand mean for all firms. Also shown in Table 3 is that the between-firm standard deviation of expected health care costs is substantially higher for small firms than large firms ($1143 versus $255). The important implication of this cost heterogeneity is that many more small firms will decide that insurance is not worthwhile than larger firms.

The bottom row of Table 3 adds on the estimated administrative costs of insurance for different size firms to come up with an approximation of the actuarily fair premiums that could be offered if all firms were to purchase insurance in a given size cohort. By comparing this imputed premium with the percentiles of expected cost, we can see how many firms of a given size would optimally choose to purchase insurance if they are risk neutral or nearly so. For example the median expected health cost of small firms (2-9 employees) is only $1480, versus the imputed premium which is $2154. Only if employees in these firms are extremely risk adverse does it make sense for them to demand health insurance when the premium is nearly 50 % above expected costs. This analysis suggests that it is perfectly rational for half of all small firms to choose not to purchase health insurance when it is offered at the actuarially fair rate, and provides an explanation for why even relatively generous subsidies may not affect firm decisions to offer insurance.

Model of the Insurance offer decision.

After merging on the mean and standard deviation of health care spending from the MEDSTAT pseudo employees onto each firm in our EHIS sample, we estimated a model of the insurance offer decision. Consistent with our theory model, we believe that the age and expected cost distributions of employees are endogenous, and hence estimated coefficients from a logit specification, shown in Table 4, reflect equilibrium rather than behavioral relationships. Nonethesless we believe that the results are still of interest. Our preferred, full model is shown in the first pair of columns. Turnover, the new variable emphasized here, is statistically insignificant and small in magnitude. We discuss this further below.

Most of the variables found to be statistically significant are the same as those explored by Bundorf (2002). Higher income firms are much more likely to offer health insurance, but more heterogeneous income firms are less likely to offer insurance. Firms with older workers are more likely to offer insurance, and firms with more age-heterogeneous workers are more likely to offer insurance. The mean of our new simulated cost distribution is too highly collinear to be interesting to include along with age and gender, so we have not included it here (it was be insignificant). Industry codes are highly significant, as are percent unionized, and whether the firm has more employees nationally.[1]

It is of considerable interest to know why certain industries, such as retail industry and construction have low rates of insurance, while wholesale trade, transportation, and mining/manufacturing have high rates. We therefore focused on rates of not offering insurance for our nine industry groups. In order to make our comparisons as clean as possible, we excluded all firms with more than ten percent of employees in unions, and firms with more employees nationally. We present the results of doing this examination primarily graphically, with the proportion not offering insurance on the vertical axis and possible explanatory variables of interest on the horizontal axis.

Figure 6 shows that industries with high turnover rates also tend to have higher rates of not offering insurance. We interpret this as a equilibrium condition, not a causal relationship. Figure 7 makes this same point, plotting average turnover rates for each industry against the proportion not offering insurance. The solid trend line highlights that higher turnover is

[1] Following Bundorf (2002) and others, we interacted this variable with dummies for firm size, which are also very significant.

associated with higher rates of not offering insurance. Figure 8 shows that the same pattern is present even after controlling for firm size and industry. To demonstrate that this is meaningful, we did the same plots for age (figure 9) which shows that after controlling for industry and firm size, there does NOT appear to be a significant relationship between firms average employee age and the insurance offer decision once one controls for industry and firm size. Consistent with the multivariate regression, mean income remains an extremely important negative predictor of whether firms do not offer insurance even after controlling for industry and size (Figure 10). Our carefully constructed mean health care cost is also positively associated with not offering insurance (Figure 11), which is interesting because age is the main driving force behind cost differences (other than industry and gender).

The last issue that we explored graphically is whether heterogeneity within firms in age, income and expected health costs is associated with the offer decision. Figures 12, 13, and 14 repeat the previous analysis using the standard deviations of age, income, and expected health costs on the horizontal axis. As before, we excluded firms that were unionized more than 10%, as well as those with more employees nationally. Age heterogeneous firms are less, not more likely to NOT offer insurance, income heterogeneity does not seem especially related to the offer decision once controlling for firm size and industry. In contrast, health cost heterogeneity is strongly positively associated with not offering insurance. Controlling for firm size and industry, firms not offering insurance have much greater variability in expected health care spending than firms that do offer insurance. This is the classic Rothschild Stiglitz type of selection result. These findings are not consistent with the heterogeneous taste argument for why some firms choose not to offer health insurance.

Returning to table 4, there is some evidence that colinearity between turnover and industry dummies, and between turnover and income may in part be masking the ability to detect a statistically significant effect of turnover. If either industry dummies or the two income variables are omitted, then the turnover variable becomes mildly statistically significant. Of greater relevance is that our theory model would suggest that expected turnover rates should drive the insurance offer decision, while what we observe and are using in our probit model is the actual turnover rates. Actual turnover is much more random than expected turnover. One could recalculate the implied effect of expected turnover on the insurance decisions while taking into account this measurement error, although we have not done so here.

Conclusions and Discussion

Our theory model provides new suggestions for why some employers might rationally decide not to offer insurance. Our empirical results lend partial support for this theory. Firms not offering insurance do have higher turnover rates, and even after controlling for firm size and industry, there is a strong positive relationship between turnover and the decision not to offer insurance. Large and small firms do not differ meaningfully in their average turnover rates, while the insurance offer decision does vary with actual turnover. Industries with high turnover also tend to have high rates of not offering insurance.

As Bundorf and others have found employer income, age heterogeneity, and expected health costs all matter in the firm's offer decision, but surprisingly more age-heterogeneous firms are more likely to offer insurance, not less. Income heterogeneity seems not to be significant. Our graphical approach and multivariate models suggest that if anything age and income heterogeneity tends to make firms more, not less likely to offer insurance. This contradicts the results and assumptions of some previous authors that taste heterogeneity makes firms less likely to offer insurance.

Our results confirm certain previous findings about why some firms are more or less likely to offer insurance to their employees, and provide new insights as well. Unionization, average employee income, firm size, and having more employees nationally all matter. But we also provide a new insight about why certain firms and certain industries are more likely not to offer insurance. Our framework provides a possible new mechanism – constraints on rates of premium increase, heterogeneous firm level expected costs, and endogenous employee turnover - for thinking about why firms may be choosing not to offer insurance. Large industry specific dummies that mostly have not been explained previously seem to be partly explained by heterogeneous health costs and high turnover rates.

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Table 1

Sample Means, RWJ 1997 EHIS sample of private employers

	All Firms (N=20585)		Firms offering Insurance (N=13587)		Firms not offering insurance (N = 6998)	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
No insurance offered	0.660044	0.4737055	1	0	0	0
turnover rate	0.484095	0.7982073	0.4534	0.7199	0.54379	0.92874
Employee characteristics						
fulltime proportion	0.876163	0.2248601	0.9038	0.1921	0.82254	0.26971
temporary proportion	0.07453	0.1840767	0.0626	0.1629	0.0976	0.21759
union proportion	0.035648	0.1585616	0.0477	0.181	0.01221	0.09761
Employee Age and Gender						
females	0.425421	0.315359	0.4241	0.2984	0.42797	0.34589
employees age <25	0.283452	0.2656942	0.2861	0.2467	0.27821	0.29905
employees age 25-34	0.300202	0.250114	0.3038	0.2247	0.29326	0.29317
employees age 35-44	0.240821	0.2408495	0.2434	0.2165	0.2358	0.28212
employees age 45-54	0.175722	0.2384135	0.1669	0.2111	0.19277	0.28328
Mean age	38.09496	6.7684754	37.921	6.181	38.4331	7.77278
within firm std of age	7.331593	3.6924686	7.9021	3.2636	6.22387	4.1916
between firm std of mean age						
income <$10k	0.058612	0.1832364	0.0329	0.1255	0.10849	0.2538
income $10-14k	0.181171	0.2851524	0.1364	0.2332	0.26813	0.34951
income$14-20k	0.235002	0.2754423	0.2286	0.2519	0.24745	0.31577
income$20-30k	0.255698	0.2753952	0.28	0.2578	0.20858	0.3012
Mean income	22.46356	7.1680783	24.06	6.5092	19.3638	7.37063
within firm std income	4.707952	3.0938258	5.3325	2.7786	3.49538	3.30748
between firm std of mean income						
Industry codes						
agriculture, fisheries, forestry	0.002235	0.0472202	0.002	0.0445	0.00272	0.05204
construction	0.080738	0.2724396	0.0719	0.2583	0.09789	0.29718
manufacturing and mining	0.140685	0.3477047	0.1718	0.3772	0.08031	0.27179
transport, commun, utilities	0.049988	0.2179252	0.057	0.2318	0.03644	0.18739
wholesale trade	0.050279	0.2185261	0.06	0.2375	0.03144	0.17451
retail trade	0.189507	0.3919203	0.1445	0.3517	0.27679	0.44745
financial services	0.17435	0.3794196	0.18	0.3842	0.16348	0.36983
professional services	0.244498	0.4297999	0.2602	0.4387	0.21406	0.4102
Firm size measures						
size=Number of full time employees	60.10838	253.14764	86.104	307.35	9.63647	35.3495
more = 1 if more employees nationwide	0.333641	0.4715246	0.4295	0.495	0.14761	0.35474
1-9 employees at establishment	0.506437	0.4999707	0.3653	0.4815	0.78037	0.41403
10-24 employees at establishment	0.209522	0.406977	0.2404	0.4273	0.14961	0.35672
25-49 employees at establishment	0.114987	0.3190136	0.1496	0.3566	0.04787	0.21351
50-99 employees at establishment	0.072043	0.258565	0.1014	0.3019	0.015	0.12158
100-249 employees at establishment	0.053631	0.2252941	0.079	0.2698	0.00429	0.06534
250+ employees at establishment	0.043381	0.2037184	0.0643	0.2452	0.00286	0.05339
more*1-9 employees at est.	0.113918	0.3177192	0.1209	0.3261	0.10031	0.30044
more*10-24 employees at est.	0.071071	0.2569499	0.0941	0.292	0.02629	0.16002
more*25-49 employees at est.	0.050134	0.2182259	0.0693	0.254	0.01286	0.11268
more*50-99 employees at est.	0.037017	0.1888086	0.0536	0.2252	0.00486	0.06954
more*250+ employees at est.	0.032159	0.1764274	0.0475	0.2127	0.00243	0.04923
more*100-249 employees at est.	0.029342	0.1687667	0.044	0.2051	0.00086	0.02927
max(0,size-5)	55.78309	252.99613	81.468	307.25	5.91455	35.1065
max(0,size-10)	52.98479	252.52386	77.978	306.86	4.45956	34.5905
max(0,size-25)	47.69351	250.59445	70.813	304.96	2.80509	33.2256
max(0,size-50)	42.43911	247.04009	63.313	301.11	1.91155	31.5332
max(0,size-100)	36.39801	239.97593	54.44	293.02	1.36939	28.9198
Simulation results						
Mean firm level predicted medical cost	1560	456	1542	508	1590	421
within-firm std of predicted medical cost	743		604		978	
between-firm std of mean predicted cost	456		508		421	

Table 2

Linear regression model of annualized total covered medical spending excluding drugs of employees

MEDSTAT MarketScan Commercially insured adults, aged 18-65

	Demographic only		Demographic with Spline on lagged costs	
R-Square	0.011		0.09135	
Root MSE	7332.497		7027.762	
N	891,857		891,857	
Dependent variable Mean	1,817		1,817	
	Coefficient	t value	Coefficient	t value
Intercept	-387	-1.63	80	0.35
Industry				
Manufact, durable Goods	-124	-4.42	21	0.64
Manufact, nondurable good:	33	0.99	281	6.26
Services	-127	-4.81	295	7.39
Transportation, Communica	-83	-2.91	438	10.33
Missing	.	.	.	.
Plane Type				
Basic/Major Medical	348	3.11	679	6.1
Comprehensive	488	23.49	270	10.79
HMO	-403	-12.69	-425	-12.57
POS	158	4.85	-222	-6.44
POS with Capitation	-266	-9.19	50	1.61
PPO	.	.	.	.
single	-47	-2.84	10	0.63
Age and age splines				
age	45	4.5	17	1.73
max(0,age-30)	-34	-2.41	-12	-0.85
max(0,age-40)	57	4.86	26	2.31
max(0,age-50)	39	2.75	36	2.65
max(0,age-60)	-203	-5.62	-205	-5.95
Discrete age-sex categories				
Female, Age 18-24	725	8.9	506	6.46
Female, Age 25-34	932	10.75	606	7.27
Female, Age 35-44	661	6.56	325	3.36
Female, Age 45-54	513	4.61	242	2.27
Female, Age 55-64	422	3.3	214	1.75
Female, Age 60-64	368	2.33	305	2.01
Male, Age 18-24	.	.	.	.
Male, Age 25-34	-150	-1.72	-81	-0.96
Male, Age 35-44	-22	-0.22	26	0.27
Male, Age 45-54	120	1.08	200	1.87
Male, Age 55-59	247	1.94	273	2.23
Male, Age 60-64	683	4.31	645	4.25
Employee classes				
Salary Non-union			-696	-16.83
Salary Union			-873	-21.06
Salary Other			-978	-20.96
Hourly Non-union			-386	-4.99
Hourly Union			-453	-5.93
Hourly Other			-792	-19.86
Non-union			-243	-9
Union			-177	-1.56
Unknown			.	.

Table 2 continued

Linear regression model of annualized total covered medical spending excluding drugs (continued)

	Demographic only		Demographic with Spline on lagged costs	
	Coefficient	t value	Coefficient	t value
Splines using lagged health spending information				
Dummy=1 if any OP$			131	2.67
OP $ in 1998			1.263	2.22
max(0,OP$-100)			-0.042	-0.07
max(0,OP$-500)			-0.112	-0.77
max(0,OP$-1000)			-0.693	-9.19
max(0,OP$-5000)			-0.140	-5.72
max(0,OP$-10000)			0.505	25.78
max(0,OP$-50000)			-0.314	-24.3
Dummy=1 if any IP$			-218	-0.22
IP$ in 1998			1.013	0.99
max(0,IP$-1000)			-1.221	-1.18
max(0,IP$-5000)			0.468	8.25
max(0,IP$-10000)			-0.044	-1.68
max(0,IP$-50000)			-0.139	-21.04
Dummy=1 if any drug$			-146	-3.79
Drug$ in 1998			1.132	2.08
max(0,drug$-1000)			1.074	1.63
max(0,drug$-5000)			0.470	1.21
max(0,drug$-10000)			-1.772	-5.27

Notes: Regressions used MEDSTAT Marketscan Commercially insured data using only full time active employees, aged 18 through 64.
Dependent variable is annualized 1999 covered inpatient plus outpatient health care costs
Spending by people eligible for only part of 1999 were annualized by dividing by the fraction of the year eligible in that year
OP$ stands for covered outpatient spending in 1998, IP$ stands for covered inpatient spending in 1998; drug$ stands for covered drug spending in 1998.

Table 3

Percentile distributions of predicted spending from 250 simulations of each firm, by firm size categories

Percentiles	1-9 employees	10-24 employees	25-49 employees	50-99 employees	100-249 employees	250+ employees	All Firms
100%	31442	10042	5440	3199	3056	2690	31442.021
99%	5310	3663	2900	2623	2470	2535	4391.507
95%	3205	2529	2281	2145	2107	2055	2769.165
90%	2615	2180	2022	1940	1925	1964	2319.001
75%	1954	1792	1726	1711	1719	1766	1828.324
50%	1480	1478	1470	1504	1541	1618	1494.586
25%	1090	1220	1285	1338	1366	1454	1215.199
10%	788	1033	1140	1204	1255	1320	946.114
5%	622	922	1067	1140	1194	1247	770.827
1%	267	767	915	1009	1083	1162	417.872
0%	0	483	743	875	952	1081	0
N	10403	4292	2348	1469	1100	893	20505
Mean predicted cost	1666	1579	1546	1552	1572	1629	1619
Std. Dev	1143	595	399	315	285	255	878
Administrative cost multiplier	1.33	1.25	1.25	1.20	1.16	1.05	1.27
Imputed premium	2154	2024	2024	1943	1878	1700	2062

Note: This table was generated by combining RWJ 1997 EHIS and MEDSTAT 1998-99 data. 250 random samples of employees from the MEDSTAT data matching the age-gender-industry intervals were drawn for each firm appearing in the EHIS data. Average predicted spending per employee is shown where predictions are generated using demographic and lagged spending splines as in Model 2 of Table 1. Imputed premiums were calculated assuming fully community rating. Imputed premiums are the grand mean average cost ($1619) increased by average administrative cost percentages based on Chu and Trapnell (2002). The percentiles from the simulated distribution for each firm size category are shown above.

Table 4
Probit models of probability of offering insurance

	Full model			Full model omitting industry dummies			Full model omitting mean income and std dev of income		
Independent variables	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.
Intercept	-3.050	***	0.088	-2.946	***	0.079	-2.041	***	0.079
Turnover rate	-0.017		0.013	-0.027	*	0.013	-0.037	**	0.013
Share age < 30	-0.199	***	0.054	-0.272	***	0.053	-0.338	***	0.052
Share age 30-40	-0.087		0.054	-0.118	*	0.054	-0.073		0.052
Share age 40-50	0.016		0.056	0.014		0.055	0.083		0.054
Std dev of age	0.009	**	0.003	0.010	**	0.003	0.019	***	0.003
Mean employee income	0.050	***	0.002	0.052	***	0.002			
Std. dev. of employe income	0.063	***	0.004	0.065	***	0.004			
Full time employee prop.	0.724	***	0.050	0.761	***	0.048	0.942	***	0.048
Temporary employees proportion	0.016		0.058	-0.047		0.057	-0.013		0.056
Unionized proportion	0.228	**	0.086	0.140		0.085	0.400	***	0.083
Female proportion	0.112		0.067	0.173	**	0.066	0.050		0.064
Agriculture/forestry/fishing	0.238		0.215				0.265		0.205
Construction	-0.048		0.055				0.074		0.053
Mining/Manufacturing	0.251	***	0.053				0.328	***	0.051
Transport/comm/pub util	0.292	***	0.065				0.335	***	0.063
Wholesale trade	0.394	***	0.066				0.496	***	0.064
Retail trade	0.063		0.046				-0.082		0.044
Finance/insurance	0.260	***	0.048				0.353	***	0.046
Professional	0.299	***	0.046				0.462	***	0.044
Employees, total	0.170	***	0.013	0.166	***	0.013	0.202	***	0.012
Employees greater than 5	-0.082	***	0.018	-0.077	***	0.018	-0.116	***	0.018
Employees greater than 10	-0.061	***	0.011	-0.062	***	0.011	-0.057	***	0.010
Employees greater than 25	-0.013	*	0.006	-0.013	*	0.006	-0.014	*	0.006
Employees greater than 50	-0.008		0.005	-0.007		0.005	-0.008		0.004
Employees greater than 100	-0.006	**	0.002	-0.007	***	0.002	-0.006	**	0.002
More employees employed nationally	0.727	***	0.027	0.741	***	0.027	0.728	***	0.026
More*Size interaction	-0.001	*	0.000	-0.001	*	0.000	-0.001	*	0.000
Simulated proportion of firms who will offer	-0.201	*	0.084	-0.185	*	0.083	-0.265	***	0.081
N	20585			20585			20585		
logL	-9019.998			-9089.77			-9715.51		

* P < 0.05
** P < 0.01
***P < .001

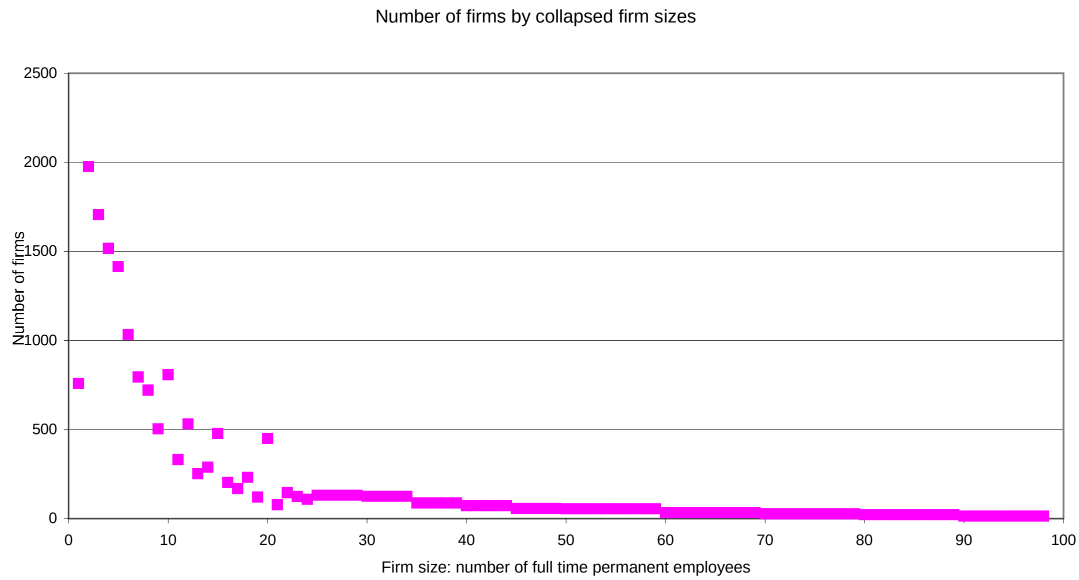


Figure 1 Number of firms by collapsed firm sizes, RWJ 1997 EHIS data, firm sizes less than 100. N=19,712. Firms with sizes between 25 and 49 inclusive were collapsed into five categories of size 5 to ensure that at least 100 firms were in each collapsed category, while firms with 50 or more enrollees were grouped into firm size intervals of ten

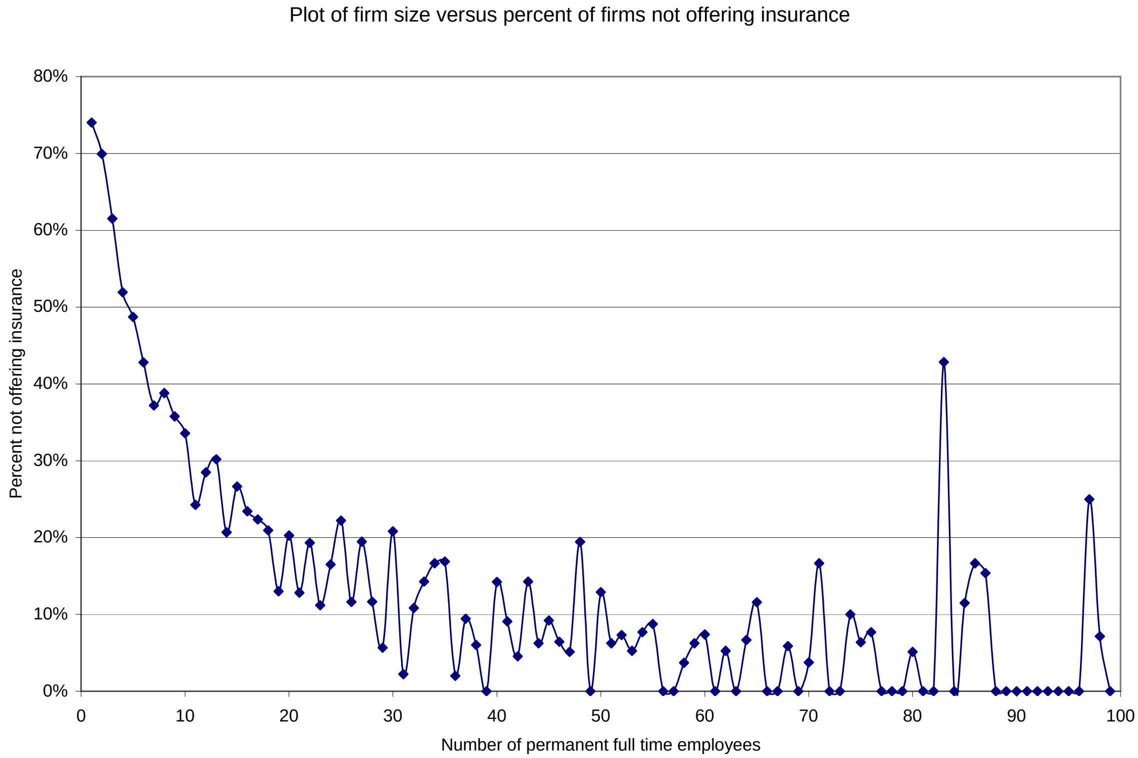


Figure 2. Plot of firm size versus percent of firms not offering health insurance. Plot uses RWJ 1997 EHIS data, for firm sizes less than 100. N=19,712. Firms with sizes between 25 and 49 inclusive were collapsed into five categories of size to ensure that at least 100 firms were in each collapsed category, while firms with 50 or more enrollees were grouped into firm size intervals of ten. Data points are sample proportions for given firm size.

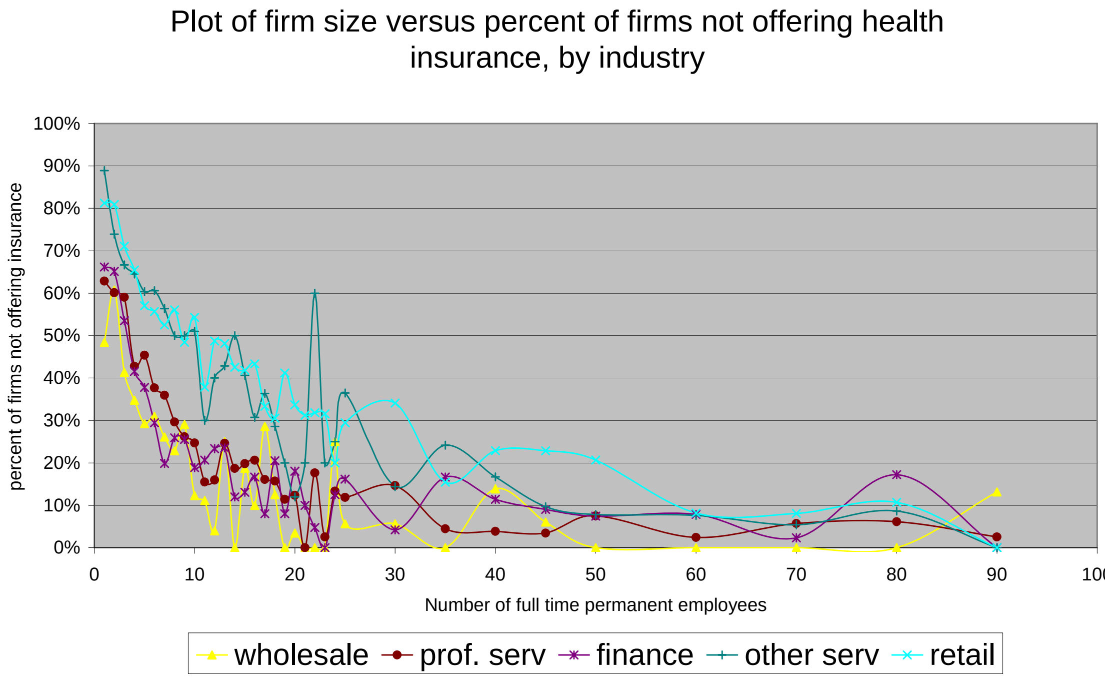


Figure 3 Plot of percent of firms not offering insurance versus firm size, by five industries. 1997 EHIS data, firms under 100 employees.

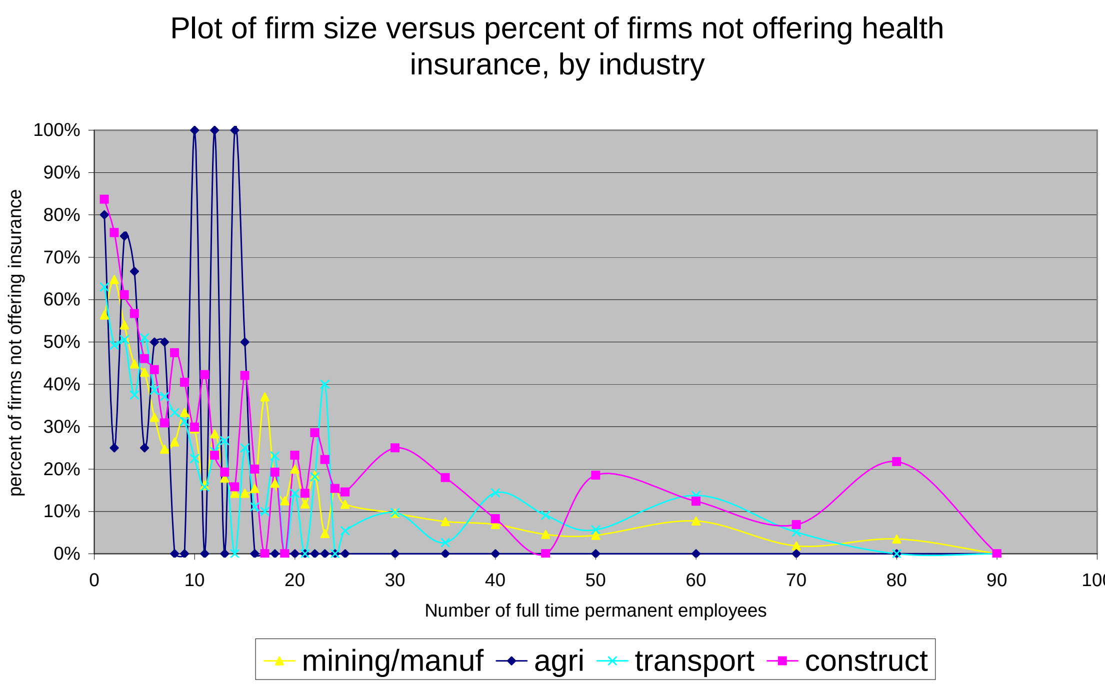


Figure 4 Plot of percent of firms not offering insurance versus firm size, by four industries. 1997 EHIS data, firms under 100 employees.

under 100 employees.

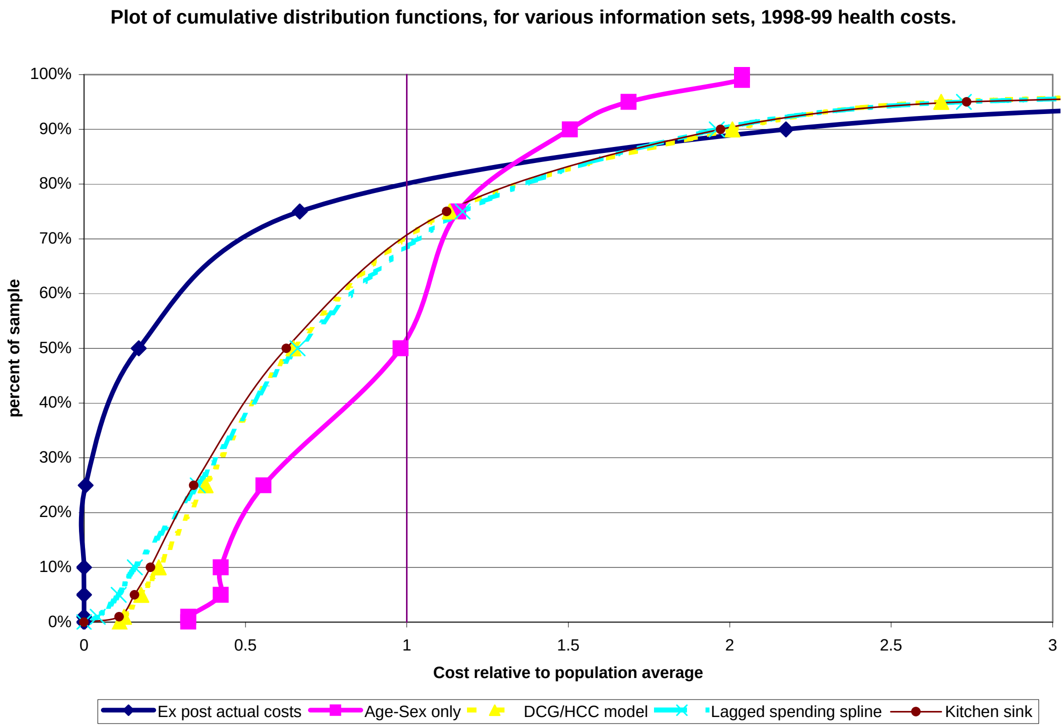


Figure 5. Distribution of expected medical spending at individual level. Predictions made using model 2 in Table 2, using MEDSTAT MarketScan data, 1998-1999.

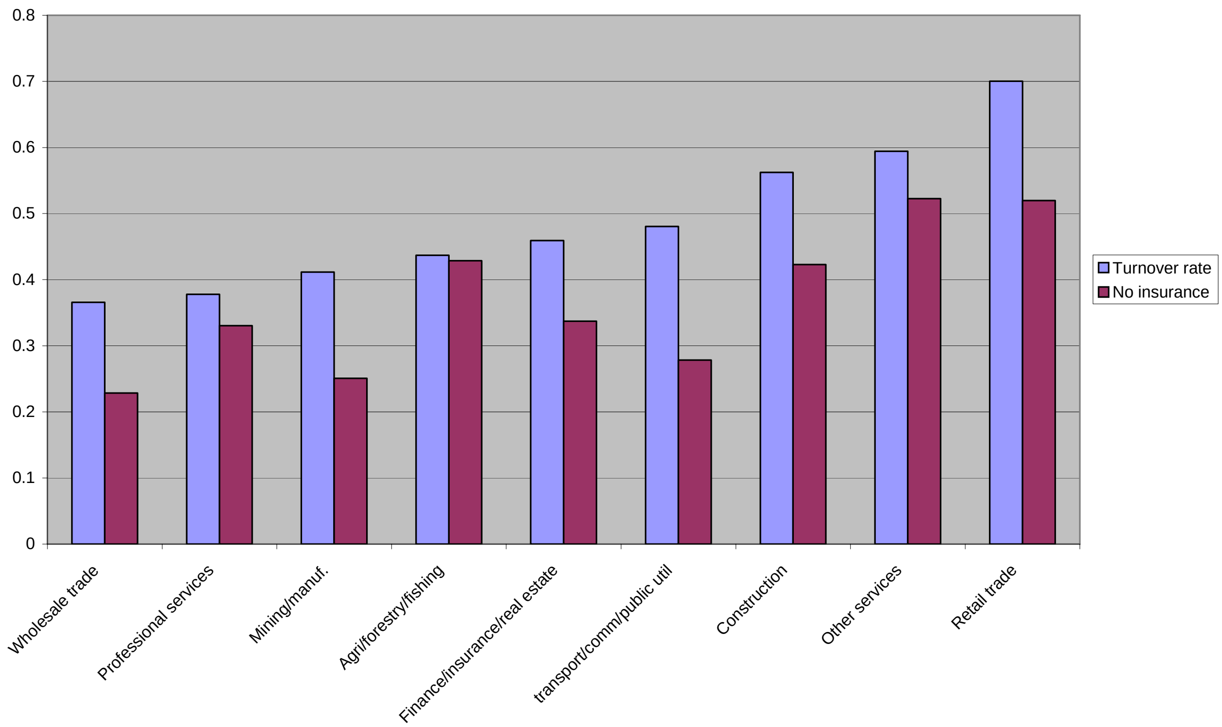
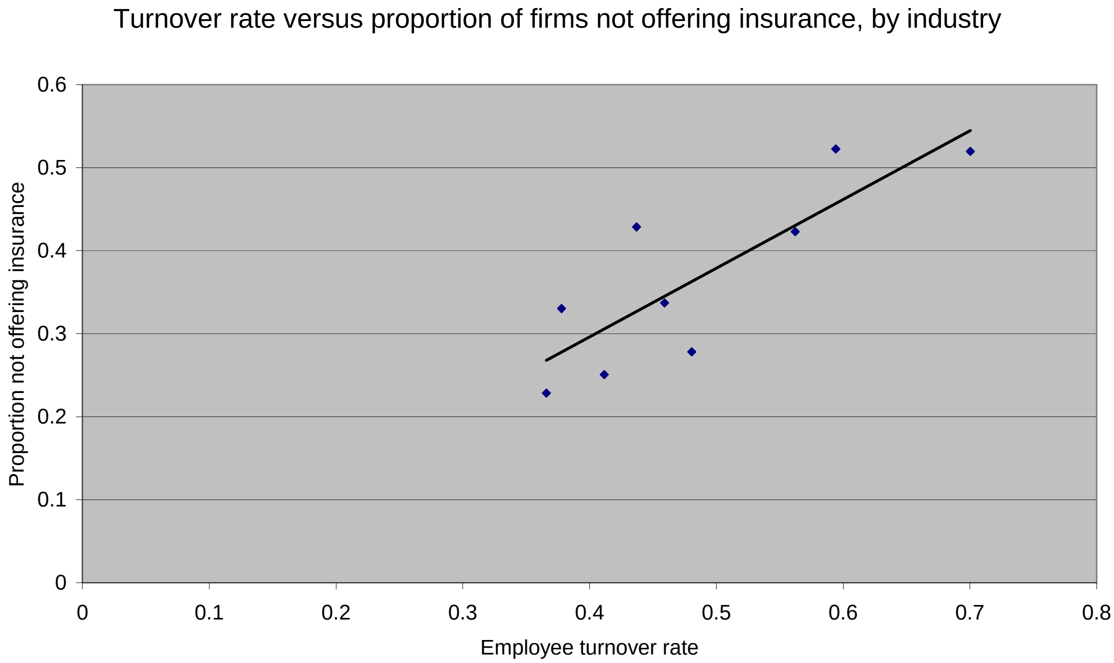


Figure 6. Turnover rate and not offering insurance, in nine industries. EHIS data, all firms.



Turnover rate versus proportion of firms not offering insurance, by industry
Proportion not offering insurance
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Employee turnover rate

Figure 7.

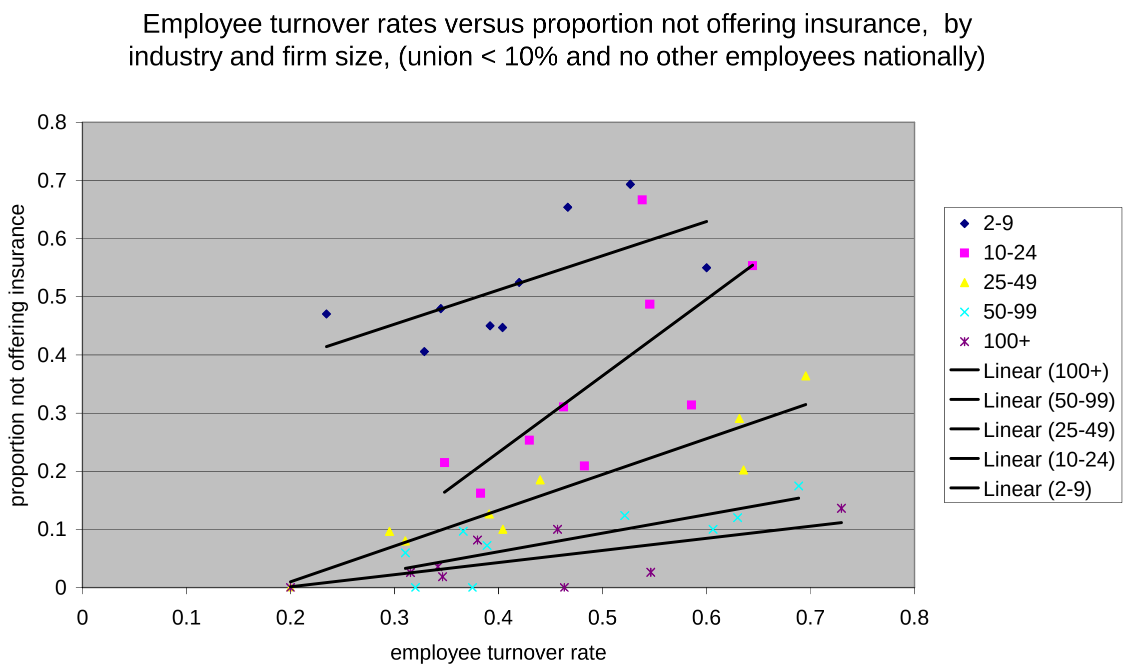

Employee turnover rates versus proportion not offering insurance, by industry and firm size, (union < 10% and no other employees nationally)
proportion not offering insurance
employee turnover rate
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
2-9
10-24
25-49
50-99
100+
Linear (100+)
Linear (50-99)
Linear (25-49)
Linear (10-24)
Linear (2-9)

Figure 8.

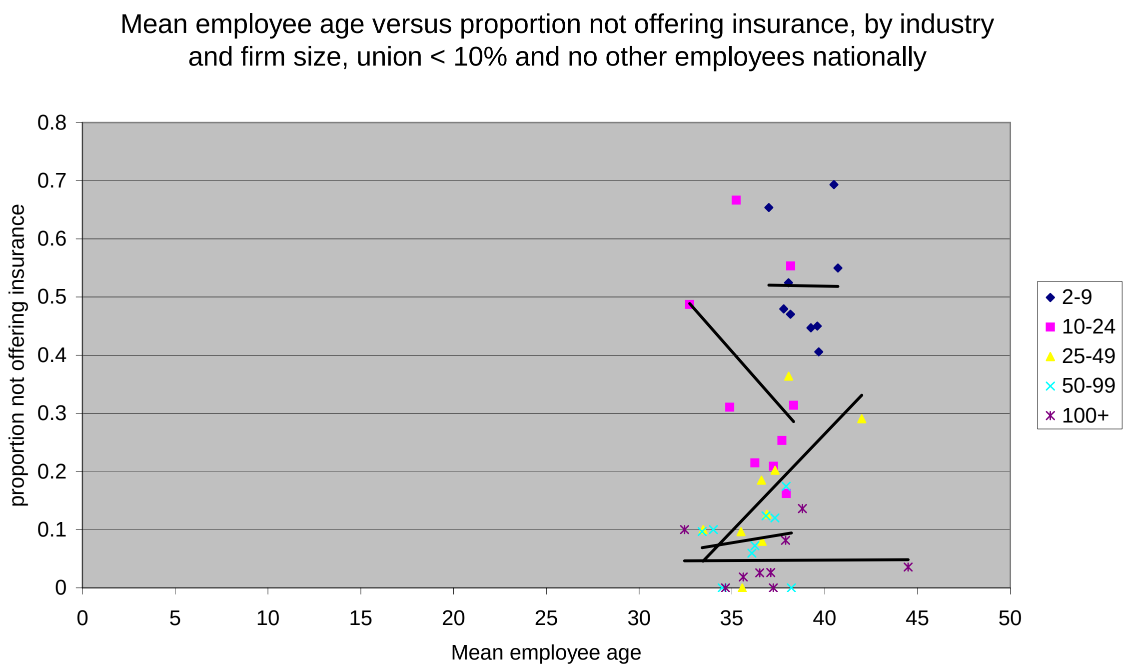
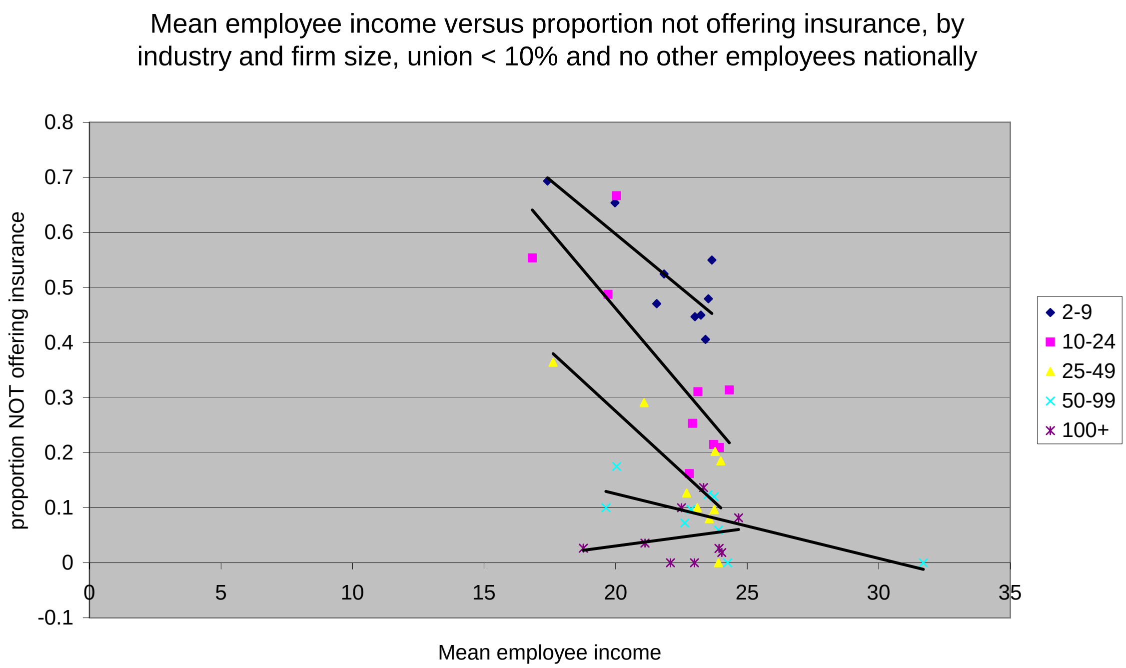

Mean employee age versus proportion not offering insurance, by industry and firm size, union < 10% and no other employees nationally
proportion not offering insurance
Mean employee age
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30
35
40
45
50
2-9
10-24
25-49
50-99
100+

Figure 9.



Mean employee income versus proportion not offering insurance, by industry and firm size, union < 10% and no other employees nationally
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0
5
10
15
20
25
30
35
proportion NOT offering insurance
Mean employee income
2-9
10-24
25-49
50-99
100+

Figure 10.

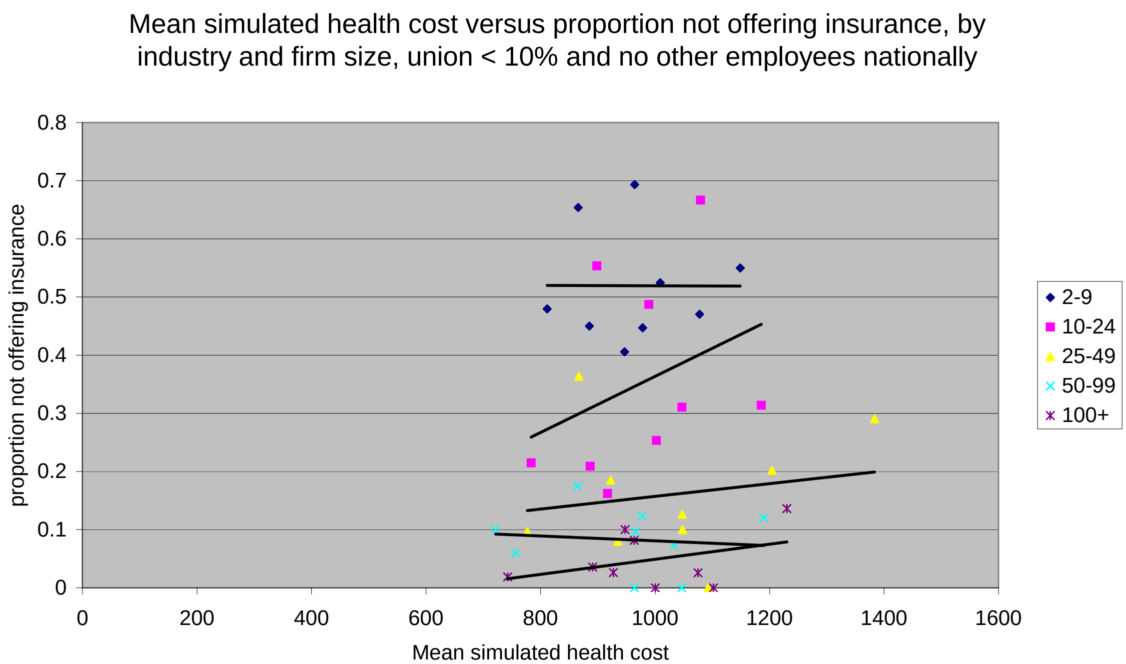

Mean simulated health cost versus proportion not offering insurance, by industry and firm size, union < 10% and no other employees nationally
proportion not offering insurance
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
1400
1600
Mean simulated health cost
2-9
10-24
25-49
50-99
100+

Figure 11.

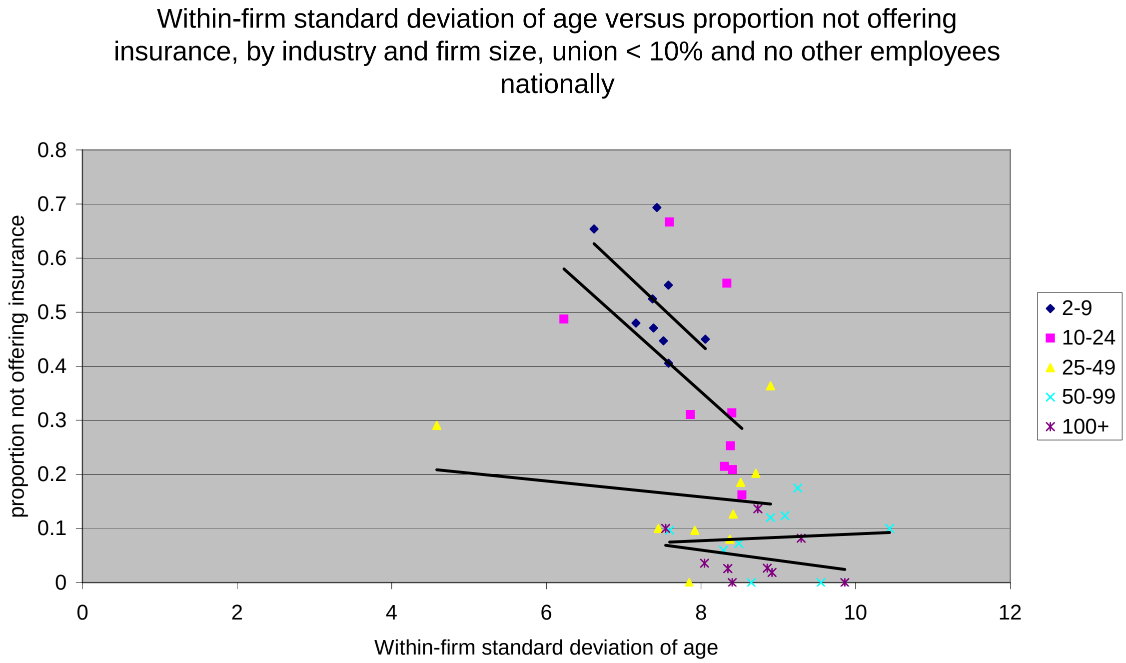


Figure 12. Relation between within firm standard deviation of age and proportion not offering insurance, by firm size. Mean employee age, by collapsed firm size. RWJ 1997 EHIS data, N=18,712. Average age was calculated for firms using five age interval proportions, (18-24, 25-34, 35-44, 45-54, 55-65) using midpoints for each interval. Proportions offering insurance in each of 9 industries were calculated for each of five firm sizes. Each points shown is the average for one industry for one firm size. Linear trend lines are shown for each firm size across industries.

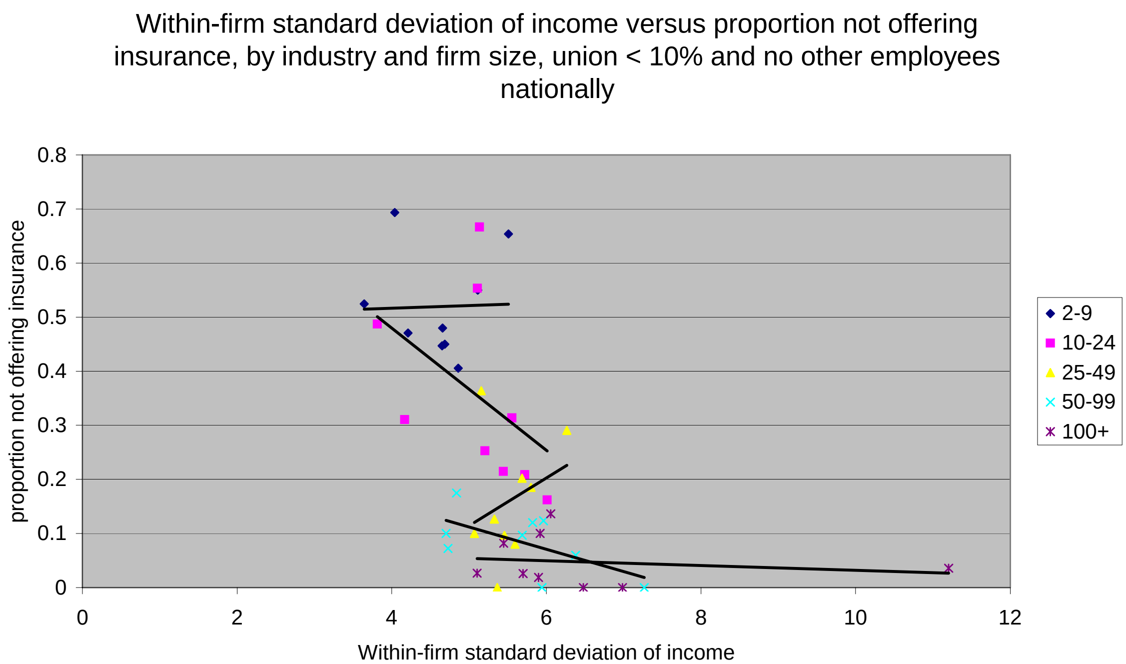

Within-firm standard deviation of income versus proportion not offering insurance, by industry and firm size, union < 10% and no other employees nationally
proportion not offering insurance
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12
Within-firm standard deviation of income
2-9
10-24
25-49
50-99
100+

Figure 13.

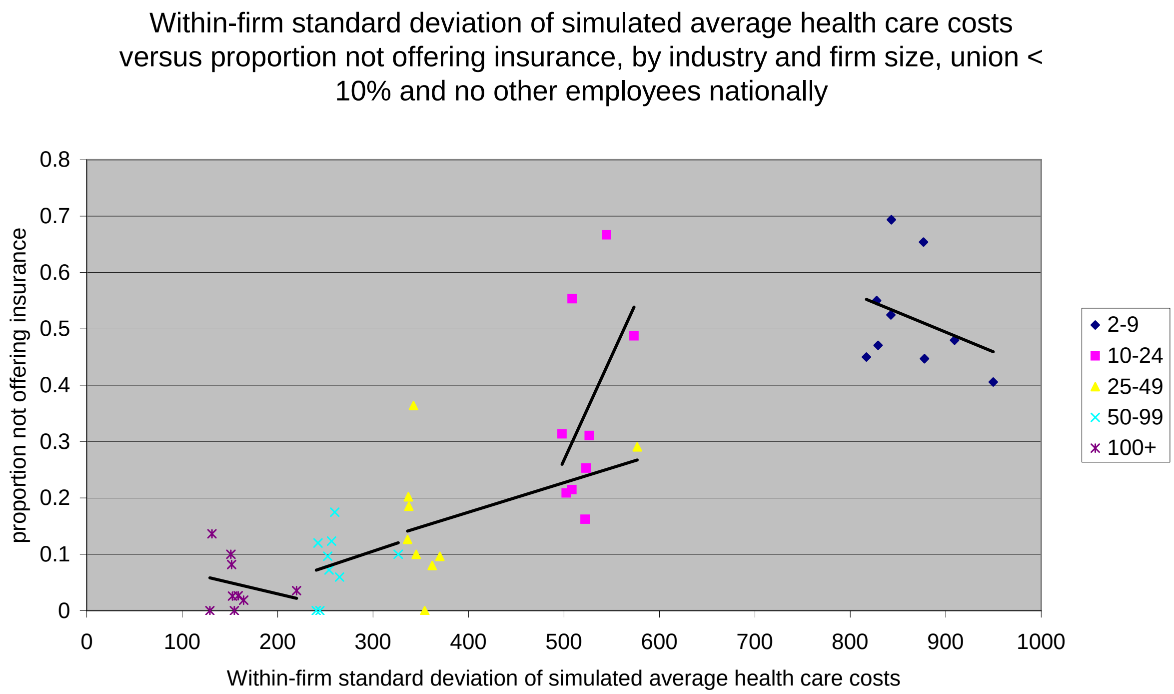

Within-firm standard deviation of simulated average health care costs versus proportion not offering insurance, by industry and firm size, union < 10% and no other employees nationally
proportion not offering insurance
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
100
200
300
400
500
600
700
800
900
1000
Within-firm standard deviation of simulated average health care costs
2-9
10-24
25-49
50-99
100+

Figure 14.

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