

**The Determinants of the Quantity of Health Insurance:
Evidence from Self-Insured and Not Self-Insured
Employer-Based Health Plans**

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The Determinants of the Quantity of Health Insurance: Evidence from Self-Insured and Not Self-Insured Employer-Based Health Plans

Abstract

This paper presents an empirical analysis of the determinants of quantity of health insurance in the context of employer-based health insurance using the micro-level data from the 1987 National Medical Expenditure Survey (NMES). It extends the previous research by including additional factors in the analysis, which significantly affect health insurance offers by employers. This paper emphasizes two determinants of employers' insurance offer decisions that are particularly relevant: union membership and self-insured versus not self-insured health plans. The conducted empirical analysis reported in this paper reveals the following predictors of higher health insurance coverage: union membership, not self-insured health plan(s), union membership in Midwest or South, as well as self-insured union membership. Further, other factors such as: age, male, income, for profit and other employer organizational forms, and firm's size determine a higher level of health insurance.

Keywords: quantity of insurance; employment-based insurance; self-insured health plans; unions; adverse selection; democratic choice; labor market

1. Introduction

Employment-based health insurance has become a primary source of private health insurance coverage in the United States provided to about 160 million people (Claxton, Gil et al. 2005; Kaiser Commission on Medicaid and the Uninsured 2007). Approximately 90 percent of privately insured population under 65 received health coverage through its workplace (Kaiser Commission on Medicaid and the Uninsured 2007). As such, based on a high relevance of health insurance obtained through employment, there exists continued policy interest in determining employers' health insurance offer decisions. In particular, the determination of amounts of health insurance offered to employees is of special concern which is also a subject of this paper.

A few empirical papers addressed this issue in the context of specific characteristics that influence the quantity of insurance offered in employment-provided health benefits. For instance, some researchers examined the impact of the size of the company (Cantor, Long et al. 1995; Gruber 2000; Marquis and Long 2001), whereas others tested the role of unionization (Pauly and Herring 1999; Marquis and Long 2001; Buchmueller, Dinardo et al. 2002) on employment-based health insurance provision. The effect of the industry composition on the quantity of insurance was investigated (Long and Marquis 1999; Marquis and Long 2001). To our knowledge, the most comprehensive study up to date in terms of the number of factors affecting the quantity of insurance was conducted by M. Susan Marquis and Stephen H. Long (2001). They investigated the impact of local market conditions on the amount of health insurance provided by small employers. Those local market characteristics included the following: marginal tax rates, employee concentration, business size, unionization, industry composition, unemployment rate, average age, average education of working population, and percent of full-time workers having full-time employed spouses.

This paper builds upon the previous literature on employer health insurance provision and coverage mentioned above. Similarly to earlier studies, the major purpose of this paper is to empirically investigate the determinants of employers' health insurance offer decisions. However, this article extends the previous research in several directions.

Specifically, it augments the study of Marquis and Long (2001) by examining all firms regardless of their size, as indicated by the number of individuals employed at a particular company (their study considered only small firms). It also investigates other potential factors that weren't accounted for in previous studies, such as: policy holder's income, gender, race, and place of residence that are hypothesized to affect employers' insurance offer decisions. Moreover, this paper emphasizes two determinants of employers' insurance offer decisions that are particularly relevant: union membership and type of health insurance coverage (e.g., self-insured/funded versus not self-insured/funded health insurance plans).

The effect of union membership received special attention in the previous literature, as it illuminates the problem of adverse selection in employer-sponsored health insurance coverage. Specifically, Robin Hanson (2005) theoretically demonstrated that the adverse selection problem is mitigated by the presence of unions which represent an instance of a democratic choice (similarly to other democratically organized groups, such as homeowners associations and churches). The intuition behind this assertion is that as a result of union democratic choice, insurance becomes less expensive for union members relative to non-union employees, which further leads unions to purchase larger amounts of insurance, all other equal. In this paper, the unionization is examined not just as a single variable, but also in the context of its potential interactions across race, regions, and insurance types that may provide additional implications.

The second important factor investigated in this study is the type of insurance coverage within employer-provided health insurance plans. In particular, this paper extends earlier work by distinguishing between two types of insurance, conventional/traditional coverage (e.g. fully-insured plans) and self-insured/funded employer health plans³, and examining their impacts on the quantity of health insurance. This is an important research problem, as self-insured health plans have become a prevalent way of providing insurance coverage to employees (Park 2000), mostly because they are considered to be cheaper

³ In the case of self-insured/funded employer health plans, the employer does not contract with an insurance company to assume the financial risk, but instead it assumes internally all or part of the financial risk associated with paying potential medical claims.

than conventional group health benefits. However, other researchers have neglected self-insurance in examining the determination of the levels of health insurance. This paper attempts to address this gap by hypothesizing that self-insuring employers may choose to offer higher contributions towards employees' total premiums because it's cheaper for them to do so, as compared to employers providing conventional health insurance.

The paper is organized in the following way. First, the background section discusses some applied work on the quantity of insurance in the context of employer-provided health coverage. Next, research questions and hypotheses guiding this research are introduced and followed by a brief discussion on an empirical analysis of the determinants of the amount of health insurance. The analytical part also elaborates on the data and the methodology used. Further, descriptive statistics and empirical results are reported and discussed in detail. Finally, concluding remarks and possible directions of future research are presented.

2. Background

2.1. Empirical Literature Review

The problem of determining the quantity of health insurance has been studied in the economic literature (Cantor, Long et al. 1995; Long and Marquis 1999; Pauly and Herring 1999; Dranove, Spier et al. 2000; Gruber 2000; Marquis and Long 2001; Buchmueller, Dinardo et al. 2002; Hanson 2005). In particular, the paper by Marquis and Long (2001) considered the largest variety of factors determining small employers' decisions to provide health insurance. This study was specifically motivated by the labor economics literature that examined fringe benefits without differentiating them into specific components, such as health insurance, life insurance contribution, or retirement benefits⁴. The objective of their study was to empirically investigate the impact of local market conditions on the amount of health insurance offered by small employers, which

⁴ Marquis and Long (2001) also reviewed the relevant literature on fringe benefits in their paper where they also emphasized their particular aspects, which they used as providing the rationale for their hypotheses. This study, however, doesn't discuss those studies on fringe benefits, but it directly reviews those papers on health insurance as a specific type of fringe benefits. Thus, an interested reader in the literature on fringe benefits can refer to the paper by Marquis and Long (2001).

was measured as their contribution to health insurance premium. Those local market characteristics hypothesized to affect the insurance offer decisions included the following: marginal tax rates, employee concentration, business size, unionization, industry composition, unemployment rate, and worker characteristics such as average age and average education of working population, and percent of full-time workers having full-time employed spouses.

Marquis and Long used the National Employer Health Insurance Survey (NEHIS), the 1997 Robert Wood Johnson Foundation (RWJF) Employer Health Insurance Survey databases, and data on special labor market features. One of the conclusions of this study was that larger firms (as measured by the number of their employees) are more likely to provide health insurance benefits and also to offer larger quantities of them, which confirms earlier findings (Cantor, Long et al. 1995; Gruber 2000). Their results also suggested that greater unionization is associated with a higher quantity of health insurance provided, which is also consistent with theoretical predictions by Hanson (2005) and Goldstein and Pauly (1976), as well as empirical findings by Buchmueller, Dinardo et al. (2002). Moreover, Marquis and Long's study showed that insurance offer rates varied with age where older employees had higher offer rates than their younger counterparts. This result is also consistent with the study by Pauly and Herring (1999). Marquis and Long also reported that the industry composition (e.g. construction, manufacturing, etc.) has no influence on employers' decisions regarding the amount of health insurance sponsored. On the other hand, they found significant differences between public and private sectors with respect to their health benefits offerings in their previous study (Long and Marquis 1999). Specifically, they concluded that private employers' contributions towards the premium were higher than the federal government's shares. On the other hand, they were lower than state and local governments' premium contributions (Long and Marquis 1999).

3. Research Questions and Hypotheses

As discussed earlier, the major goal will be to investigate determinants of the quantity of insurance provided in employer-sponsored health insurance, with particular emphasis on two major factors: the union membership and the type of health insurance. In addition, other determinants will be considered in the analysis, including firm's size, policy holder's income, gender, race, and place of residence. Consequently, the major research questions and the corresponding hypotheses to be investigated in this paper are shown in Table 1.

Table 1: Major Research Questions and Hypothesized Answers Investigated

	<i>Research Question (RQ)</i>	<i>Hypothesized Response (RH)</i>
1.	What is the influence of demographic characteristics on the amount of insurance?	Older employees are provided with higher amount of insurance (Pauly and Herring 1999; Marquis and Long 2001). Gender and race are expected to have a significant effect. A higher quantity of insurance is correlated with a higher income/compensation.
2.	What is the effect of geographic variations on the quantity of insurance?	Regional variations are expected to have a statistically significant impact, which may partially be a consequence of regional income variations.
3.	What are the effects of the employer organization form and the size of an establishment on the quantity of insurance?	State and local governments' premium contributions are expected to be higher than their private firms' counterparts (Long and Marquis 1999). Larger companies tend to offer larger quantities of health insurance (Cantor, Long et al. 1995; Gruber 2000; Marquis and Long 2001).
4.	What is the impact of the presence of unions on the quantity of insurance?	Unions purchase larger quantities of health insurance (Marquis and Long 2001; Hanson 2005) as a result of their democratic choice

		(Hanson 2005).
5.	What is the impact of self-insured versus not self-insured insurance plans on the quantity of insurance?	Since self-insuring health plans are usually cheaper for employers than conventional health insurance (Park 2000), self-insuring employers choose to offer higher contributions towards employees' total premiums.

4. Empirical Analysis

This section introduces the data used in this study in terms of their source, aspects of their coverage, and their relevance. Further, the methodology used is discussed with respect to the measure of insurance coverage, the model, and statistical techniques used. Finally, the empirical results are discussed in detail.

4.1. Data Source

The empirical analysis was conducted using the 1987 National Medical Expenditure Survey (NMES) Household Survey, Employment-Related Coverage dataset (United States Department of Health and Human Services. Agency for Health Care Policy and Research 1992) sponsored by the Agency for Health Care Policy and Research in the U.S. Department of Health and Human Services. The 1987 NMES survey included the first release of data from the Health Insurance Plan Survey (HIPS), which to authors' knowledge has also been its only dataset that has been publicly available. The NMES Employment-Related Coverage dataset represents a stratified random sample of the civilian non-institutionalized population of the United States and it's unique for the purposes of this study, as it breaks private health insurance information into self-insured and not self-insured plans.

The original NMES sample covers 165 geographic areas as primary sampling units that represent 127 distinct geographic regions, in which around 15,000 households were interviewed on their health insurance during 1987 (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001). After interviewing

households, 11,422 employers (with the response rate of 85.5%), 353 unions (with the response rate of 76.7%), and 745 insurance companies (where 75.6% of them responded) were contacted in order to verify the information on the plan, including enrollment, premiums, and payment sources (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001).

Employers that assumed financial liability for claims or expenses covered under their health insurance plans were considered self-insured (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001). Further, before the data were recorded to the final dataset, the information collected on self-insured plans was subjected to rigorous automated checking routines. Those respondents whose data failed those checks were contacted again in order to verify the data provided by them. Missing out-of-pocket expenses were imputed using a weighted sequential hot-deck procedure (U.S. Department of Health and Human Services Agency for Health Care Policy and Research 2001).

4.2. Sample Construction

The analysis is based on a person-level data set constructed by selecting the subset of employees covered by employer health insurance. Further, in order to make estimates across health plan-levels, the sample of policy holders was considered as either who were covered only by self-insured plan(s) or those covered only by not self-insured plans. In other words, employees whose coverage consisted of multiple plans where at least one plan was self-insured and at least one plan was not full-insured were excluded from the samples under discussion (e.g. persons obtaining a mixture of both, self-insured and not self-insured coverage weren't included in order to disentangle differences among those plans)⁵. Finally, only complete records were included in the empirical analysis. That is, observations with values denoted as “don't know”, “refused”, “never will know”, “not

⁵ There is no information on proportions of the component parts of this mixed type of insurance coverage (e.g. proportions of self-insured and traditional plans). Thus, including this type of coverage in the analysis would generally not be meaningful and it would potentially lead to misleading results; that's why it has been excluded from the analysis.

ascertain”, or “inapplicable” were not taken into account in the examination. As such, the final count of observations considered contained 3,522 individuals.

4.3. Methodology

This section examines the measure of insurance coverage. It also introduces the model and statistical techniques used in the empirical analysis.

4.3.1. Measure of Insurance Coverage

The insurance coverage is purchased in the form of an aleatory contract, e.g. the contract that depends on uncertain events in the future that may or may not take place or contingency as to both profit and loss. Therefore, it’s highly difficult to be measured or quantified. Thus, the amount of insurance coverage held may only be estimated. Researchers have developed different proxies of a measure of insurance coverage provided, such as the lifetime limit on benefits⁶, the annual stop-loss⁷ (Crocker and Moran 2002), the actuarial value of plan⁸ (Long and Marquis 2000), and the expected indemnity benefit from a health policy (Browne 1992)⁹. Further, researchers who studied the quantity of insurance in employer-based health coverage, which is also the purpose of this paper, mostly used the employer share toward total annual premium as a legitimate approximation of the quantity of the insurance (Cantor, Long et al. 1995; Long and Marquis 1999; Dranove, Spier et al. 2000; Gruber 2000; Marquis and Long 2001).

Hence, this paper follows their methodology used with respect to measuring health insurance coverage. In other words, the quantity of insurance held is considered in terms of the employer’s contribution to its employee’s total annual premium. In order to make self-insured and not self-insured health coverage comparable (as self-insured

⁶ The lifetime limits on benefits are defined as the measure of the extent to which health conditions of a person holding insurance are insured.

⁷ The annual stop-loss determines the threshold level of medical expenditures in which excess the policyholder is no longer responsible to contribute by making co-payments.

⁸ The actuarial value of plan is defined as the ratio of expected benefit payments of the insurance plan to expected medical expenditures for a standardized population where it’s accounted for geographic variations in insurance prices.

⁹ Browne’s proxy of the insurance quantity defined as the expected indemnity benefit is represented as a difference between all estimated medical expenses items and out of pocket expenditures incurred by the policy holders.

organizations assume financial liability for claims or expenses incurred), the 1987 NMES also constructs the employer contribution towards the premium as the expected value of its funding per policy holder. As such, the created employer's premium in self-insurance is the sum of claims paid, premiums for re-insurance of larger claims, and administrative costs resulting from running self-insured that are associated with hospital and medical plans¹⁰.

4.3.2. Models and Estimation Issues

The regression technique is ordinary least squares (OLS)¹¹. The lognormal model is applied, as it's suggested by the variance stabilization techniques such as the Box-Cox and the coded groups' methods. The methods used here also imply that heteroskedasticity isn't an issue here (Draper and Smith 2001). This type of the model is also consistent with the literature that indicates that medical expenditures typically are best approximated by a lognormal distribution (Browne 1992).

Thus, the outcome measure in the insurance prediction equation was selected to be the natural log of the amount of insurance ($Log(I_i)$) that is provided by the employer towards employee's i health coverage, as expressed in the nominal monetary terms. The analytic model of demand for insurance controls for the following characteristics: the union membership in an establishment of a person's employment, demographic and geographic information of policy holders, employers' characteristics, health insurance type, and some interaction effects between union membership and other characteristics (see Table 2 for the summary of independent variables).

¹⁰ That means that funding relating to separate vision, drug and dental plans within self-insured coverage are excluded from the estimated value of the employer premium in self-insurance.

¹¹ We acknowledge that there may be a potential endogeneity problem of workforce composition in our data. Instrumental variables estimation could be used to test the presence of endogenous selection and to control for possible reverse causation. However, due to lack of adequate instruments in our data, we were not able to use this technique. Hence, our empirical analysis is based only on the OLS estimation whereas a potential endogeneity issue is acknowledged. On the other hand, some previous studies claimed that "insurance is exogenous or [...] any self-selection is minimal" (Newhouse 1981) in employer-based health insurance, as it usually includes large employer groups. Thus, even though we were not able to address this issue in our empirical analysis, our results should not be biased because our data pertain mostly to large employers.

Six specifications of the model were selected in order to test the robustness of the obtained results:

- [I] OLS results with the union effect only;
- [II] OLS output with unions and demographic explanatory variables;
- [III] OLS results with unions, demographic, and geographic independent variables;
- [IV] OLS results with union membership, demographic, geographic and insurance control variables;
- [V] OLS outcomes with union effect, demographic, geographic, insurance, and employer specific explanatory variables (e.g. all single variables);
- [VI] OLS output with unions, demographic, geographic, insurance, employer specific variables, and some interaction terms.

Thus, the applied specifications of the model could be expressed in the following ways:

$$[I] \text{ Log } (I_i) = \alpha + \beta_1 \text{UNION} + \mu,$$

$$[II] \text{ Log } (I_i) = \alpha + \beta_1 \text{UNION} + \beta_2 \text{DEMOGRAPHIC} + \mu,$$

$$[III] \text{ Log } (I_i) = \alpha + \beta_1 \text{UNION} + \beta_2 \text{DEMOGRAPHIC} + \beta_3 \text{GEOGRAPHIC} + \mu,$$

$$[IV] \text{ Log } (I_i) = \alpha + \beta_1 \text{UNION} + \beta_2 \text{DEMOGRAPHIC} + \beta_3 \text{GEOGRAPHIC} + \beta_4 \text{INSURANCE} + \mu,$$

$$[V] \text{ Log } (I_i) = \alpha + \beta_1 \text{UNION} + \beta_2 \text{DEMOGRAPHIC} + \beta_3 \text{GEOGRAPHIC} + \beta_4 \text{INSURANCE} \\ + \beta_5 \text{EMPLOYER} + \mu,$$

$$[VI] \text{ Log } (I_i) = \alpha + \beta_1 \text{UNION} + \beta_2 \text{DEMOGRAPHIC} + \beta_3 \text{GEOGRAPHIC} + \beta_4 \text{INSURANCE} \\ + \beta_5 \text{EMPLOYER} + \beta_6 \text{INTERACTION TERMS} + \mu,$$

where I_i = employer contribution towards policy holder's (PH's) health coverage

In particular, the union variable is expressed as a ratio of all employees who are members of a union at a particular establishment. Further, the demographic control variables consist of sex (as a binary variable with 1 if male), age (expressed in years), including its squared term (to allow for a diminishing character of age), and race (Hispanic, Black, White whereas White is an omitted control variable), as well as income variables. Since the data set doesn't provide any exact information on insurance beneficiaries' earnings, the income level is approximated by some indicative variables. Specifically, those

income proxies include the proportion of the total number of employees earning below \$5/hour¹² and dichotomous information on other employee fringe benefits (such as paid vacation, paid sick leave, life insurance and retirement plan). Next, the vector of geographic variables takes into account four main regions according to the U.S. region specification (Northeast, Midwest, South, and West, with West as an omitted control variable).

On the other hand, the insurance type of employment-related coverage is a categorical variable standing for self-insured plans where not self-insured plans are the omitted variable. Further, the other group of explanatory variables is the vector of employer's control variables that includes establishment size (numeric), and the employer organization form (such as for profit, non-profit, government and other, where the last one is an omitted variable). Another issue is how the union membership interacts with regional and racial indicators to influence the quantity of health insurance. To examine these potential relationships, some interaction terms between the union variable and regional as well as racial variables are included within the last category of explanatory variables. Finally, μ stands for a random error term.

4.4. Empirical Results

The empirical analysis addresses determinants of the quantity of insurance provided in employer-sponsored health insurance, both self-insured and not self-insured plans.

4.4.1. Descriptive Statistics

Table 2 presents summary statistics of all variables also including the dependent variable used in the analysis as well as their descriptions. Frequency tables of categorical variables are listed in the Appendix.

The sample applied in the empirical analysis considers 3,522 individuals who receive employer-sponsored health benefits and reside in various geographic regions in the U.S. at the last round in 1987 when the survey was conducted. The average age of the policy

¹² \$5/hour could be understood here as a cut for the minimum hourly wage in 1987.

holder was approximately 40-41 years with three youngest employees being 16 years and one oldest individual being 92 years of age. On average 56% of policy holders were males and 44% were females. The racial composition of the analyzed subset includes 16% Blacks, 9% Hispanics, and 75% Whites. In terms of the income level, on average 14% of employees receiving health insurance benefits earned below \$5/hour and none of employees obtained such a low income at 2,081 establishments. In the case of other income proxies, on average 97% of employees were offered paid vacation, 87% of them were provided with paid sick leave, 91% of individuals obtained life insurance from their employers, and 76% of them were provided with employer-sponsored retirement plans. On average, 21% of employees belonged to unions at an establishment.

Next, with respect to geographic regions of policy holders' place of residence, 20% of individuals lived in the Northeast, 27% lived in the Midwest, 36% resided in the South, and 17% of employees lived in the West. Further, on average 38% of policy holders were provided with self-insured health coverage and 62% of employees obtained traditional health insurance.

On the other hand, in terms of the employer specific control variables, the sample under discussion considers establishments with the mean of 967 employees where ten smallest firms employed one person, each and 97 largest companies employed 10,000 people, each. On average, 70% of establishments represented for profit type, 12% were non-profit type, 16% were government type, and the remaining 2% represented other employer organizational form(s).

Finally, the employer contribution towards the total premium that is used in the construction of the dependent variable has the mean of about \$1,707 ranging from about \$19 as the minimum to \$10,000 as the maximum contribution.

Table 2: Descriptive Statistics of Variables in Employer-Sponsored Health Plans

<i>Variable</i>	<i>Mean</i>	<i>Std Dev</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Description</i>	<i>Format</i>
<i>Union Membership</i>						
UNION	0.21	0.33	0	1	Union membership as a proportion of all employees at an establishment	Proportion
<i>Insurance</i>						
SELFINSURED	0.38	0.49	0	1	Employment-related coverage consists of a plan(s) that is (are) all self-insured	FULL-INSURED (reference)
<i>Demographic</i>						
AGE	40.90	14.55	16	92	Age in the last round in 1987	Years
MALE	0.56	0.49	0	1	Policy holder (PH) sex	1 if MALE, 0 if FEMALE (omitted)
BLACK	0.16	0.36	0	1	Policy holder (PH) gender	Relative to WHITE
HISPANIC	0.09	0.28	0	1	Policy holder (PH) gender	Relative to WHITE
WHITE	0.76	0.43	0	1	Policy holder (PH) gender	Referenced variable
LOW INCOME	0.14	0.91	0	50.28	Proportion of the total number of employees earning less than \$5.0./hr	Proportion
PAID VACATION	0.97	0.17	0	1	Paid vacation offered by the employer	1 if YES, 0 if NO (omitted)
PAID SICK LEAVE	0.87	0.34	0	1	Paid sick leave offered by the employer	1 if YES, 0 if NO (omitted)
LIFE INSURANCE	0.91	0.29	0	1	Life insurance offered by the employer	1 if YES, 0 if NO (omitted)
RETIREMENT PLAN	0.76	0.43	0	1	Retirement plan offered by the employer	1 if YES, 0 if NO (omitted)

<i>Geographic</i>						The U.S. Census region of the PH's residence	
NORTHEAST	0.20	0.40	0	1		Northeastern region	WEST (omitted)
MIDWEST	0.27	0.44	0	1		Midwestern region	WEST (omitted)
SOUTH	0.36	0.50	0	1		Southern region	WEST (omitted)
WEST	0.17	0.38	0	1		Western region	Omitted variable
<i>Employer</i>							
FOR PROFIT	0.70	0.46	0	1		Employer organization type is for profit	GOVERNMENT (reference)
NON- PROFIT	0.12	0.33	0	1		Employer organization form is non-profit	GOVERNMENT (reference)
OTHER	0.02	0.14	0	1		Employer organization form is other	GOVERNMENT (reference)
GOVERNMENT	0.16	0.37	0	1		Employer organization type is state/local government	Referenced category
TOTALEMP	967.19	2,062.92	1	10,000.00		Total number of employees at a particular location of an establishment	Numeric
<i>EMPLOYER CONTRIBUTION</i>	1,707.33	1,149.41	19.46	10,000.00		Employer contribution towards the premium	Numeric (\$) (used in the construction of the dependent variable)
Number of Observations							3,522

Note: PH=Policy Holder

4.4.2. Discussion

Table 3 reports the empirical outcomes from OLS that include the estimated parameters, p-values and standard errors of the quantity of insurance equations for health insurance. It also lists the OLS coefficients of the log-level model as converted to exact percent differences¹³.

4.4.2.1. Union and Insurance Type Factors

One of the major two variables under consideration, the union membership, is very statistically significant in all five outputs reported ($p_{\text{value}} < 0.0001$). In the model specification extended by interaction terms [VI], it's also statistically significant; however, the level of its statistical significance is slightly lower than in two other cases ($p_{\text{value}} = 0.035$). Hence, all provided outputs are consistent with each other with respect to the union effect demonstrating that unions have a statistically significant impact on insurance consumption. Moreover, this relationship is positive, which implies that a higher proportion of union members as employees of a company results in a higher quantity of insurance (see Figure 4 for the illustration of the union variable's coefficient expressed as percent differences across all models). Thus, the extent of this finding varies depending upon the model specification where the largest effects are observed when interaction variables are excluded from the examination. Moreover, the magnitude of this impact isn't only of economic significance, but these data also provide evidence for the research hypothesis (RH4) stating that unions as a form of democratic organizations consume more insurance (Hanson 2005) and are also consistent with the earlier empirical findings (Marquis and Long 2001; Buchmueller, Dinardo et al. 2002).

Furthermore, another determinant this study pays a special attention to include insurance specific control variables. The obtained findings imply here that self-insured plans are characterized by a lower health coverage offered, when compared to not self-insured plans. This result is very statistically significant in [VI] ($p_{\text{value}} = 0.002$) and statistically significant in [V] ($p_{\text{value}} = 0.022$), but it's not of statistical significance in [IV]. Hence,

¹³ The OLS results are converted to the percent differences by using the following general formula: $\% \Delta^{\wedge} = 100 * (\exp^{\beta * \Delta x} - 1)$ which in case of $\Delta x = 1$ takes the form of: $\% \Delta^{\wedge} = 100 * (\exp^{\beta} - 1)$ (β stands for regression estimates). The OLS outputs list the percent differences for one unit change in independent variables.

contrary to our expectations (RH5), the results imply that self-insured plans, as compared to traditional insurance, lead to a lower quantity of insurance purchased. Its magnitude is estimated to be of about 6-9% (in [V] and [VI], respectively). In other words, even if providing self-insured coverage is cheaper than offering conventional insurance coverage, self-insuring employers don't offer larger quantities of health insurance to their employees. Instead, they choose to offer a lower amount of health insurance to their workers as a way of reducing their labor costs, as suggested by the empirical results.

4.4.2.2. Other Single Type Estimates

According to the obtained results, control variables within demographic characteristics also influence the amount of insurance provided. In particular, the age effect is highly statistically significant and it has a positive impact on insurance coverage, which, however diminishes over time ($p_{\text{value}} < 0.0001$ for age and its squared term). That may imply that older policy holders may be offered higher amounts of health insurance, which may not only provide evidence for our hypothesis (RH1), but it may also correspond to findings obtained by others (Pauly and Herring 1999; Marquis and Long 2001)¹⁴. However, it needs to be acknowledged that it is plausible that this causation may go in the opposite direction as well (e.g., more generous employers in terms of the levels of health benefits offered may attract older and/or sicker employees). Further, female-male differentials are very statistically significant across all model variations as well ($p_{\text{value}} < 0.0001$) and its estimate is positive. Thus, it may indicate that males consume more insurance than females by approximately 32-36%. The statistical significance of this relationship was hypothesized (RH1); however, its direction wasn't. This effect may be biased upwards, as we don't control for education due to lack of appropriate data. However, it may also be explained by the income effect, if this is statistically significant. In other words, if income and broadly understood compensation is correlated with the quantity of insurance offered, and if on average males earn higher incomes than females, then correspondingly, males may be provided with higher amount of health insurance sponsored.

¹⁴ To emphasize is here the fact even though the direction of this relationship is consistent with the findings in Marquis and Long (2001), this result wasn't statistically significant in their study.

In fact, our empirical findings imply that the income level is statistically significant. In particular, the income level, as expressed by the proportion of the number of employees earning less than \$5/hr at a particular establishment isn't statistically significant. However, other approximations of income level have statistically significant effects on insurance. Paid vacation, paid sick leave and retirement plan, as those income proxies, imply that providing them (as opposed to not providing) leads to an increase of the quantity of insurance purchased by about 18-31% (see Figures 1-3 for illustrations of the coefficients of these benefits expressed as percentage differences). Thus, offering those benefits by an employer also suggests a higher provision of health care benefits, which may be understood broadly as an income effect, as expected (RH1). However, offering life insurance as another proxy of the income level isn't statistically significant¹⁵. On the other hand, there is no significant impact either of race (as hypothesized), nor the interaction effects between unions and race on the amount of insurance.

These findings are also characterized by some geographical variations. Specifically, the results obtained indicate that only the South is statistically significant ($p_{\text{value}} < 0.0001$ and $p_{\text{value}} = 0.0003$), as referenced to the West. The predicted sign of the coefficient is negative that further indicates that employees in the Southern states held less insurance by approximately 12-17% (depending on the model variation) than their counterparts in the Western states. A possible explanation, which was also suggested as one of the research hypotheses (RH2), may refer to different economic conditions, and thus, lower earnings in those regions of the country as opposed to the Western geographic areas (e.g. an income effect).

Moreover, in terms of employer specific characteristics, two forms of the organizational type of the company, specifically for profit and other types are statistically significant relative to state/local government type (non-profit form isn't statistically significant). Both types of employer organizations, the other and for profit forms have positive

¹⁵ It's only statistically significant at the 10% significance level in the model VI. Since this isn't a high level of statistical significance and the effect isn't consistent with other model specifications, overall the effect isn't considered to be of statistical significance.

coefficients suggesting that they tend to provide their employees with higher quantities of health coverage (by about 23% and 17-22%, respectively) as compared to their government counterparts. Since the data don't provide information on the other type of the organizational form (perhaps it may include the federal government, but it may also include other form of the company), it's difficult to relate directly the findings to our hypothesis (RH3). However, the results with respect to the for profit type seem to be contradictory to our expectations that state/local government types typically offer more generous health insurance benefits than private firms. As such, they contradict the previously obtained findings by Long and Marquis (1999). Further, the size of the company in terms of its total employment impacts insurance in very statistically significant way ($p_{\text{value}} < 0.0001$) in both models ([V] and [VI]). In fact, the data provide evidence that the larger the company the more health insurance it provides to its employees (e.g. a change in the company size by 100 results in an increase of health coverage offered by about 0.30%). This result was hypothesized earlier (RH3) and it also corresponds to conclusions obtained by others (Cantor, Long et al. 1995; Gruber 2000; Marquis and Long 2001).

4.4.2.3. Interaction Effects

The last group of control variables that includes interaction effects between the union membership, as one of the main variables under investigation, with some other independent variables, such as insurance type, regions, and race (within [VI]) offer other implications. In particular, the effect of self-insured union members is of some statistical significance as compared to traditionally insured union employees ($p_{\text{value}} = 0.096$). It implies that those union members tend to consume more health insurance by about 13% than those who don't obtain self-insured coverage. Further, the unionized employees in Midwest and South are provided with more health coverage by approximately 29% and 50%, respectively, as compared with their counterparts in Western states ($p_{\text{value}} = 0.017$ and ($p_{\text{value}} = 0.0004$, respectively). Both of these findings imply that the union effect offsets the regional and insurance type effects. In other words, even though self-insured plans and the South as single control variables are correlated with a lower quantity of insurance, if interacted with the union variable, they tend to lead to a higher amount of

insurance. Thus, by interacting regional and insurance variables with the union variable, the union effect is high enough to offset the diminishing character of self-insurance and South as compared if they're examined as separately.

Table 3: OLS Results in Employer-Sponsored Health Plans (Dependent Variable: Quantity of Insurance)

<i>Independent Variables:</i>	<i>Model I</i>		<i>Model II</i>		<i>Model III</i>		<i>Model IV</i>		<i>Model V</i>		<i>Model VI</i>	
	<i>Coeff. (%)</i>	<i>P value (std. error)</i>	<i>Coeff. (%)</i>	<i>P value (std. error)</i>	<i>Coeff. (%)</i>	<i>P value (std. error)</i>	<i>Coeff. (%)</i>	<i>P value (std. error)</i>	<i>Coeff. (%)</i>	<i>P value (std. error)</i>	<i>Coeff. (%)</i>	<i>P value (std. error)</i>
<i>UNION MEMBERSHIP</i>												
UNION	0.578 (78.2%)	<.0001*** (0.036)	0.432 (54%)	<.0001*** (0.037)	0.378 (46%)	<.0001*** (0.038)	0.378 (46%)	<.0001*** (0.038)	0.386 (47%)	<.0001*** (0.039)	0.198 (21.9%)	0.035** (0.094)
<i>INSURANCE</i>												
SELFINSURED							-0.003 (-0.3%)	0.909 (0.024)	-0.058 (-5.6%)	0.022** (0.025)	-0.091 (-8.7%)	0.002*** (0.029)
<i>Demographic</i>												
AGE			0.034 (3.5%)	<.0001*** (0.004)	0.034 (3.5%)	<.0001*** (0.004)	0.034 (3.5%)	<.0001*** (0.004)	0.037 (3.8%)	<.0001*** (0.004)	0.038 (3.9%)	<.0001*** (0.004)
AGE ²			-0.0003 (-.03%)	<.0001*** (0.00004)	-0.0003 (-.03%)	<.0001*** (0.00004)	-0.0003 (-.03%)	<.0001*** (0.00005)	-0.0003 (-.03%)	<.0001*** (0.00005)	-0.0004 (-.04%)	<.0001*** (0.00005)
MALE			0.309 (36.2%)	<.0001*** (0.023)	0.309 (36.2%)	<.0001*** (0.023)	0.309 (36.2%)	<.0001*** (0.023)	0.286 (33%)	<.0001*** (0.024)	0.278 (32%)	<.0001*** (0.023)
BLACK			-0.051 (-5%)	0.111 (0.032)	-0.007 (-0.7%)	0.832 (0.033)	-0.007 (-0.7%)	0.833 (0.033)	-0.006 (-0.6%)	0.854 (0.032)	0.018 (1.8%)	0.648 (0.039)
HISPANIC			-0.014 (-1.4%)	0.724 (0.041)	0.007 (0.7%)	0.869 (0.041)	0.007 (0.7%)	0.869 (0.041)	0.013 (1.3%)	0.760 (0.041)	0.002 (0.2%)	0.962 (0.047)
LOW INCOME			-0.008 (-0.8%)	0.532 (0.013)	-0.007 (-0.7%)	0.558 (0.013)	-0.007 (-0.7%)	0.558 (0.013)	-0.005 (-0.5%)	0.664 (0.012)	-0.003 (-0.3%)	0.777 (0.012)
PAID VACATION			0.274 (31.5%)	<.0001*** (0.068)	0.239 (27%)	0.0005*** (0.068)	0.239 (27%)	0.0005*** (0.068)	0.169 (18.4%)	0.013** (0.068)	0.172 (18.8%)	0.011** (0.068)
PAID SICK LEAVE			0.076 (7.9%)	0.036** (0.036)	0.080 (8.3%)	0.028** (0.036)	0.080 (8.3%)	0.027** (0.036)	0.103 (10.8%)	0.005*** (0.036)	0.089 (9.3%)	0.014** (0.036)
LIFE INSURANCE			-0.049 (-4.8%)	0.240 (0.041)	-0.030 (-0.3%)	0.466 (0.042)	-0.030 (-0.3%)	0.471 (0.042)	-0.057 (-5.5%)	0.167 (0.042)	-0.07 (-6.8%)	0.092* (0.041)
RETIREMENT PLAN			0.119 (12.6%)	<.0001*** (0.030)	0.121 (12.9%)	<.0001*** (0.030)	0.121 (12.6%)	<.0001*** (0.030)	0.143 (15.4%)	<.0001*** (0.031)	0.149 (16.1%)	<.0001*** (0.031)

GEOGRAPHIC											
NORTHEAST				0.047 (4.8%)	0.214 (0.038)	0.047 (4.8%)	0.216 (0.038)	0.049 (5%)	0.192 (0.038)	0.1001 (10.5%)	0.027** (0.045)
MIDWEST				0.025 (2.5%)	0.479 (0.036)	0.025 (2.5%)	0.477 (0.036)	0.026 (2.6%)	0.469 (0.035)	-0.034 (-3.3%)	0.419 (0.043)
SOUTH				-0.140 (-13%)	<.0001*** (0.034)	-0.140 (-13%)	<.0001*** (0.034)	-0.123 (-11.6%)	0.0003*** (0.034)	-0.187 (-17%)	<.0001*** (0.039)
EMPLOYER											
FOR PROFIT								0.197 (21.8%)	<.0001*** (0.034)	0.158 (17.1%)	<.0001*** (0.035)
NON-PROFIT								0.070 (7.25%)	0.110 (0.044)	0.042 (4.3%)	0.348 (0.044)
OTHER								0.214 (23.9%)	0.013** (0.086)	0.206 (22.9%)	0.017** (0.086)
TOTALEMP								0.00003 (0.003%)	<.0001*** (0.000006)	0.00003 (0.003%)	<.0001*** (.000006)
INTERACTIONS											
UnionSelfinsured										0.125 (13.3%)	0.096* (0.075)
UnionNortheast										-0.113 (-10.7%)	0.308 (0.111)
UnionMidwest										0.256 (29.2%)	0.017** (0.108)
UnionSouth										0.404 (50%)	0.0004*** (0.114)
UnionBlack										-0.098 (-9.3%)	0.303 (0.095)
UnionHispanic										0.030 (3%)	0.812 (0.125)
INTERCEPT	7.087 (0.014)	<.0001	5.774 (0.118)	<.0001	5.818 (0.120)	<.0001***		5.668 (0.123)	<.0001	5.744 (0.124)	<.0001
Observations		3,522		3,522		3,522		3,522		3,522	
R-squared		0.067		0.145		0.156		0.172		0.181	

Notes: * Significant at the 10% statistical significance level; ** Significant at the 5% statistical significance level; *** Significant at the 1% statistical significance level; PH=Policy Holder; 2 tail test; The OLS results reported as the percent differences apply to for $\Delta x=1$ and are calculated by applying the following formula: $\% \Delta^{\wedge} = 100 * (\exp^{\beta} - 1)$

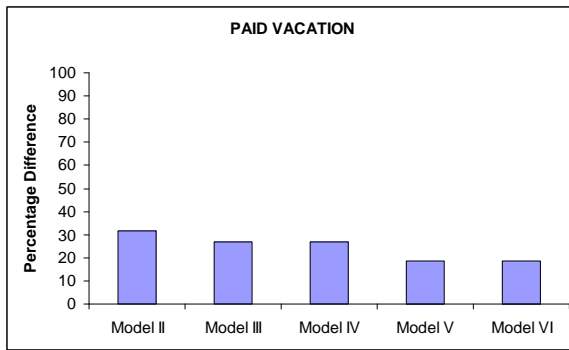


Figure 1: Paid Vacation Benefit's Coefficient across Models

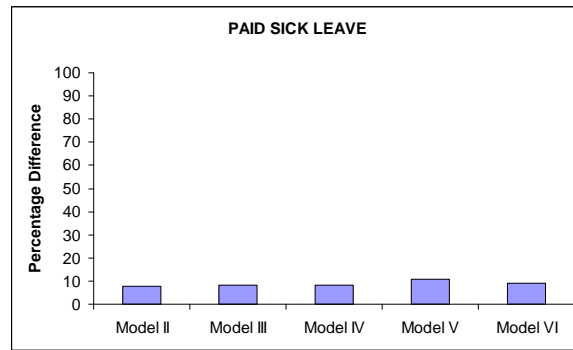


Figure 2: Paid Sick Leave Benefit's Coefficient across Models

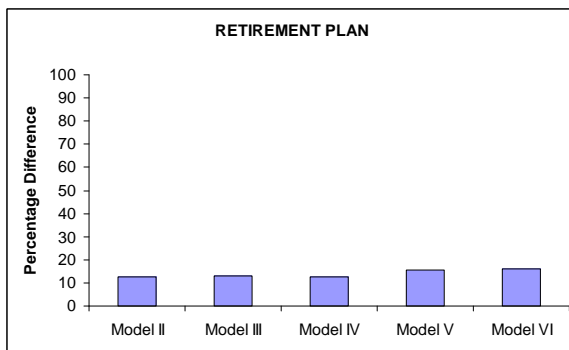


Figure 3: Retirement Plan Benefit's Coefficient across Models

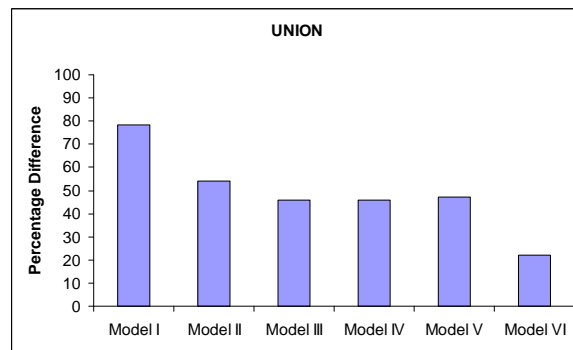


Figure 4: Union Membership's Coefficient across Models

5. Conclusions

This paper presented an empirical analysis of the determinants of quantity of health insurance in both self-insured and not self-insured employer-based health plans using the micro-level data from the 1987 National Medical Expenditure Survey (NMES) Household Survey. In particular, this study extended the previous research on a few margins, by including all establishments despite their size, by accounting for income, gender, race, regional variations, and by considering self-insured, and not self-insured health benefits.

In terms of union membership, insurance type, and their interaction effects, the following determine higher quantity of health insurance: union membership, not self-insured health plan(s), union membership in Midwest or South, as well as self-insured union membership. Further, with respect to demographic, geographic, and employer specific

factors, the obtained empirical evidence identified the following predictors of higher health insurance coverage: age, male, income, for profit and other employer organizational forms (as compared to the government type), and firm's size. On the other hand, based on the data used, a lower quantity of health insurance is best predicted by the following factors: female, Southern regions, self-insured health insurance coverage, and state/local government.

The empirical analysis presented in this paper considered a relative large selection of factors. However, the future research may extend this analysis by considering several additional factors, such as other labor market characteristics. Provided that an adequate data set is found, more demographic variables could also be included in the analysis, such as education, and direct income information to eliminate its approximations used in this study. Given appropriate data, the instrumental variable estimation could be applied to control for a potential endogeneity problem that could be compared against the benchmark OLS model.

Moreover, empirical results relating to the union membership can be re-examined in the context of its impact on adverse selection in insurance, as suggested by the theoretical predictions by Hanson (2005). This interpretation will necessarily be indirect using the quantity of health insurance provided, as the data used in the dataset didn't include any information on individual risk types. As such, adverse selection can't be determined explicitly. Since under-provision of insurance is a major problem associated with adverse selection and the result of this study shows the way the union membership affects the quantity of insurance purchased, we may be able to indirectly draw inferences in terms of adverse selection. In particular, the data provide evidence that an increasing quantity of health insurance offered is associated with an increasing number of employees being union members (which is the opposite of under-provision of insurance). As such, these empirical results would suggest that "democratic organizations such as unions suffer less from adverse selection in insurance" (Hanson 2005). However, this issue should be further investigated directly by including the data on risk types of individuals if those become available. This in turn will allow us to verify the suggested interpretation above.

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Appendix:

Frequency Tables of Categorical Variables in Employer-Sponsored Health Coverage

<i>Variable</i>	<i>Value</i>	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Frequency</i>	<i>Cumulative Percent</i>
<i>Demographic</i>					
MALE	0	1,533	43.53	1,533	43.53
	1	1,989	56.47	3,522	100.00
BLACK	0	2,970	84.33	2,970	84.33
	1	552	15.67	3,522	100.00
HISPANIC	0	3,215	91.28	3,215	91.28
	1	307	8.72	3,522	100.00
PAID VACATION	0	107	3.04	107	3.04
	1	3,415	96.96	3,522	100.00
PAID SICK LEAVE	0	458	13.00	458	13.00
	1	3,064	87.00	3,522	100.00
LIFE INSURANCE	0	329	9.34	329	9.34
	1	3,193	90.66	3,522	100.00
RETIREMENT PLAN	0	838	23.79	838	23.79
	1	2,684	76.21	3,522	100.00
<i>Geographic</i>					
NORTHEAST	0	2,818	80.01	2,818	80.01
	1	704	19.99	3,522	100.00
MIDWEST	0	2,579	73.23	2,579	73.23
	1	943	26.77	3,522	100.00
SOUTH	0	2,259	64.14	2,259	64.14
	1	1,263	35.86	3,522	100.00
<i>Employer</i>					
FOR PROFIT	0	1,071	30.41	1,071	30.41
	1	2,451	69.59	3,522	100.00
NON- PROFIT	0	3,091	87.76	3,091	87.76
	1	431	12.24	3,522	100.00
GOVERNMENT	0	2,950	83.76	2,950	83.76
	1	572	16.24	3,522	100.00
<i>Insurance</i>					
SELFINSURED	0	2,165	61.47	2,165	61.47
	1	1,357	38.53	3,522	100.00