ESSAYS IN HEALTH ECONOMICS

EMPIRICAL STUDIES ON EMPLOYMENT-BASED HEALTH INSURANCE PLANS AND HOSPICE CARE

Ph.D. Dissertation Defense

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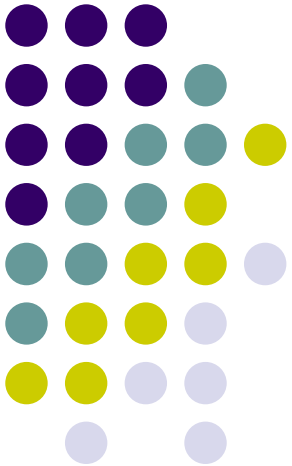

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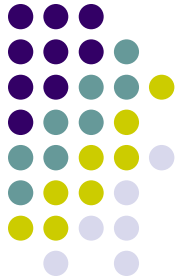
Introduction

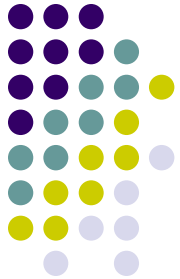


- Dissertation research focuses on issues in health economics
- Empirical studies address two major topic areas
  - Employment-based health insurance plans
    - Part I: Determinants of employers' premium contribution
    - Part II: Price elasticity in self-insured health plans
  - Hospice care
    - Part III: Impact of hospice ownership and certification on length of hospice use

Introduction cont.

- Self-insurance
  - As opposed to the insurer bearing the risk, employer assumes internally all or part of the financial risk associated with paying medical claims
- Hospice Care
  - Provided to terminally ill
  - Focuses rather on pain management than curative treatments
  - Supplied by 3,600 hospice providers (2004)
  - Used by 18% of elderly people (2000)

Part I: Determinants of Employers' Contributions

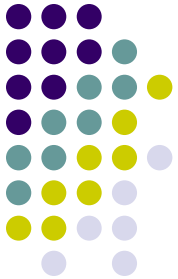


- Investigates the factors affecting the employer's contributions towards health insurance premiums
- Extends previous work by
  - Distinguishing between traditional and self-insured health plans
  - Considering all firms regardless of size
  - Accounting for other factors, including income, poverty level, policy holder's sex, race, and place of residence

Part I: Previous Work

- Higher employer's contributions attributed to
  - Larger firms (Marquis and Long 2001, Dravove et al. 2000)
  - Unionization (Buchmueller et al. 2002, Goldstein and Pauly 1976, Hanson 2005, Marquis and Long 2001)
  - Family coverage (Marquis and Long 2001)
- Industry type does not affect employers' contributions (Marquis and Long 2001)
- Inconsistent result with respect to age and education
  - Age and education are not statistically significant (Marquis and Long 2001)
  - Employers' contributions are higher in areas with older and more educated employees (Pauly and Herring 1999)

Part I: Main Research Questions



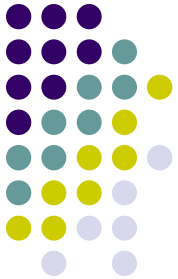
Research Question 1

- What is the impact of the presence of unions on the employer's contribution?

Predicted Response 1

- Theory prediction
  - Unions purchase larger quantities of health insurance (Goldstein and Pauly 1976; Hanson 2005) because it's less expensive for union members
- Confirmed by earlier empirical findings
  - Buchmueller et al. 2002, Goldstein and Pauly 1976, Marquis and Long 2001

Part I: Main Research Questions cont.



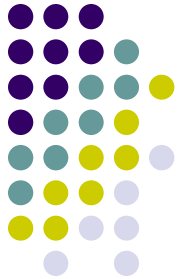
Research Question 2

- What is the impact of self-insured vs. not self-insured health plans on the employer's contribution?

Predicted Response 2

- Self-insuring employers may choose to offer higher contributions towards employees' total premiums based on their cost advantages (Park 2000)
  - Exemptions from paying state insurance premiums taxes and complying with state mandates
  - No requirement to hold reserves, offer mandated benefits, and meet consumer protections
  - Greater flexibility in insurance plan design

Part I: Data and Study Sample



- Two datasets from the 1987 National Medical Expenditure Survey (NMES)
  - Employment-related coverage dataset
  - Household survey dataset
  - Cross-sectional and person-level data
  - Breaks insurance information into self-insured plans
- Study Sample
  - Includes holders of group self-insured and not self-insured plans
    - Excludes persons obtaining a mixture of self-insured and traditional coverage
  - Considers 6,014 in (1)-(2) and 2,973 observations in (3)-(5) model specifications

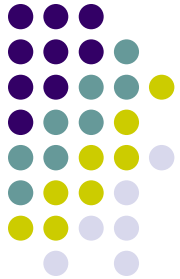
Part I: Methodology

- Dependent variable

  $\ln(I_i)$=ln(employer's contribution)

  - For self-insured coverage, employer's contribution is the expected value of its funding per PH (incl. claims paid, premiums for re-insurance, and administrative costs)
- Main explanatory variables
  - **UNION** expressed twofold in the same equation
    - As the "don't know" dummy variable
    - Continuous variable (%)
  - **INSURANCE**
    - Self-insured vs. not self-insured health plans (not self-ins. as an omitted variable)

Part I: Methodology cont.



- Other control variables
  - **TYPE:** type of coverage held
    - Single, family, and two-party
  - **DEMOGRAPHIC**
    - Sex, age, and race
  - **SES:** socio-economic status characteristics
    - Family income, poverty status, benefits provided by the employer (paid vacation, paid sick leave, life insurance, and retirement plan), and education
  - **GEOGRAPHIC:** the U.S. Census region
    - Northeast, Midwest, South, and West
  - **EMPLOYER:** employer's specific characteristics
    - Employer organization form, establishment size, and industry

Part I: Methodology cont.

OLS models with robust standard errors:

1. $\log(I_i) = \alpha + \beta_1 UNION + \beta_2 INSURANCE + \beta_3 TYPE + \mu$

2. $\log(I_i) = \alpha + \beta_1 UNION + \beta_2 INSURANCE + \beta_3 TYPE + \beta_4 DEMOGRAPHIC + \mu$

3. $\log(I_i) = \alpha + \beta_1 UNION + \beta_2 INSURANCE + \beta_3 TYPE + \beta_4 DEMOGRAPHIC + \beta_5 SES + \mu$

4. $\log(I_i) = \alpha + \beta_1 UNION + \beta_2 INSURANCE + \beta_3 TYPE + \beta_4 DEMOGRAPHIC + \beta_5 SES + + \beta_6 GEOGRAPHIC + \mu$

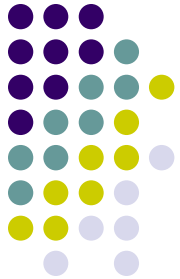
5. $\log(I_i) = \alpha + \beta_1 UNION + \beta_2 INSURANCE + \beta_3 TYPE + \beta_4 DEMOGRAPHIC + \beta_5 SES + + \beta_6 GEOGRAPHIC + \beta_7 EMPLOYER + \mu$

Part I: Main Results

y=ln(employer's contribution)	(1)	(2)	(3)	(4)	(5)
UNION MEMBERSHIP					
Union (applicable as the reference)					
DON'T KNOW	0.1648***	0.1616***	0.1767**	0.1618**	0.1494**
	(0.0355)	(0.0371)	(0.0721)	(0.0723)	(0.0723)
UNION(percentage)	0.0040***	0.0038***	0.0020**	0.0015	0.0014
	(0.0006)	(0.0006)	(0.0009)	(0.0009)	(0.0009)
SELF-INSURANCE	0.2483***	0.2502***	0.1813***	0.1975***	0.1987***
	(0.0270)	(0.0272)	(0.0372)	(0.0377)	(0.0426)

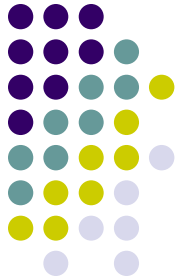
- The direction of the union effect corresponds to theory predictions and earlier empirical findings
  - In contrast to earlier literature, mixed result obtained when geographic and employer's characteristics were accounted for (not statistically significant)
    - Union effect may be specific for regions, employer organization type, firm's size, and industry
- The effect of self-insured health plans confirms our expectations

Part I: Contributions and Limitations



- Contributions
  - Distinguishes between traditional and self-insured health plans
  - Considers all firms regardless of size
  - Accounts for other factors, including income, poverty level, policy holder's sex, race, and place of residence
  - Re-examines unionization
  - Re-tests age and education
- Limitations
  - Uses relatively old dataset (1987)
  - Exists a potential endogeneity problem
    - Available data don't allow to control for it

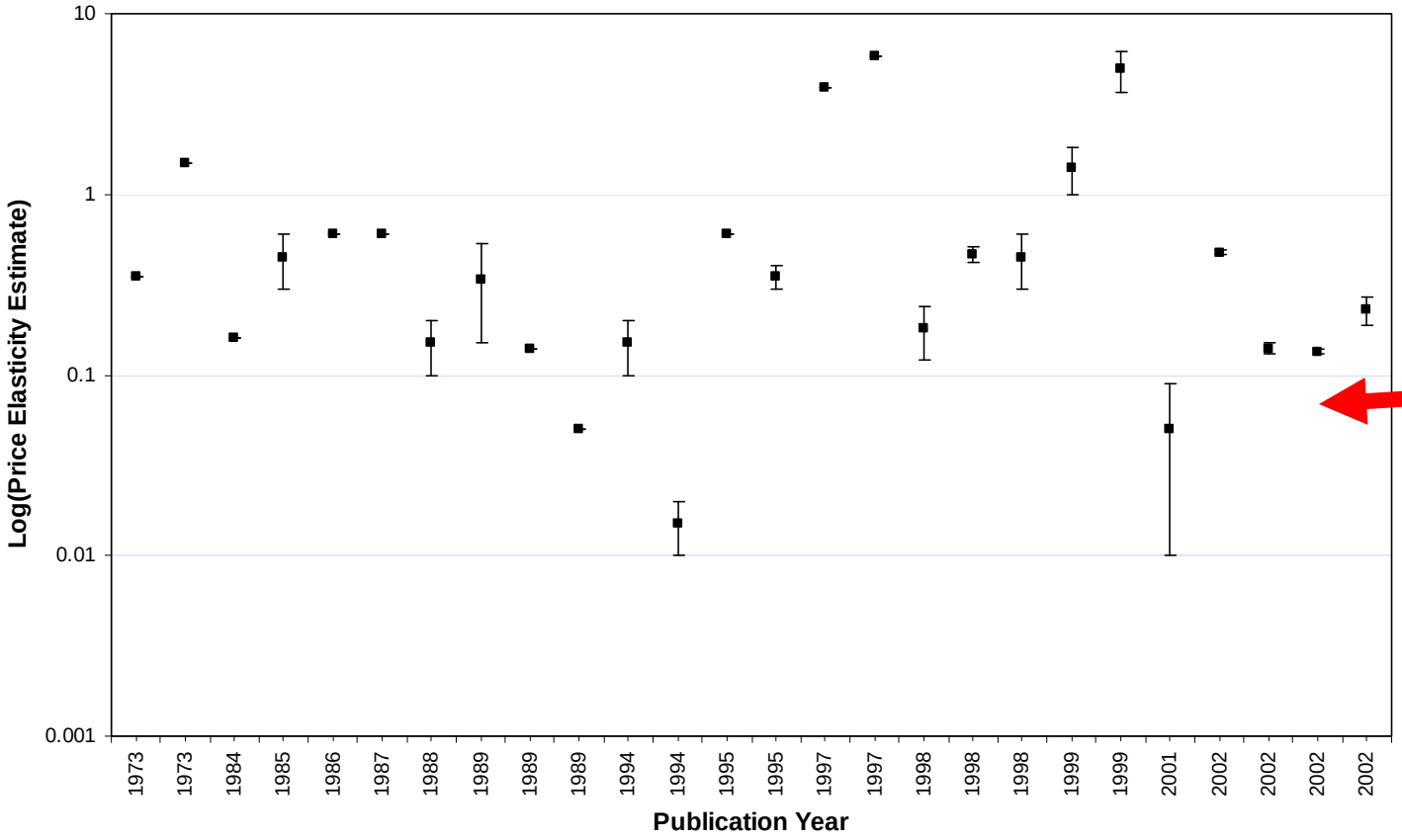
Part II:
Price Elasticity of Demand



- Estimates elasticity of the premium in self-insured plans with respect to their price
  - Defined as the responsiveness of demand to changes in price
- Advances existing research by
  - Examining self-insured health plans that were not studied before
  - Recognizing administrative costs associated with operating self-insurance as its implicit price
- Compares it to previous findings for traditional health insurance plans
  - Impossible to use the same methodology to estimate price elasticity of traditional insurance: no information on administrative costs of conventional coverage

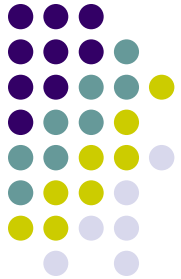
Part II: Previous Work

- "No definitely established range of price elasticities in the literature" (Royalty and Solomon 1999)
- Existing estimates of price elasticity of demand are inelastic (<1 in absolute terms) with their mid-estimate of -0.17



Large variation of price elasticity estimates of demand found in the literature

Part II: Main Research Question



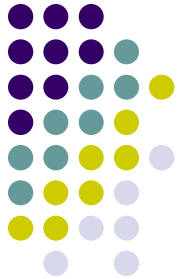
Research Question

- What is the price elasticity of demand in self-insured health plans, and how does it relate to other estimates across studies?

Predicted Response

- Earlier empirical findings regarding traditional insurance
  - The price elasticity is hypothesized to be in an inelastic range of the demand

Part II: Data and Study Sample



- Similar to Part I, two datasets from the 1987 National Medical Expenditure Survey (NMES)
  - Employment-related coverage dataset
  - Household survey dataset
  - Cross-sectional and person-level data
  - Breaks insurance information into self-insured plans
- Study Sample
  - Includes employees covered by self-insured health plans only
  - Considers 815 in (1)-(2) and 399 observations in (3)-(5) model specifications

Part II: Methodology

- Dependent variable

  $\ln(I_i)$=ln(premium)

  - For self-insured coverage, its equivalent is constructed as the expected value of total funding of self-insured plans per policy holder

- Main explanatory variable

  ln(PRICE)=ln(admin.costs/total claims) per enrollee

  - Price defined as “loading fee” above expected benefits that mostly relates to the administrative costs of insurance (Phelps 2002)

Part II: Methodology

- Other control variables
  - **DEMOGRAPHIC**
    - Sex, age, and race
  - **GEOGRAPHIC:** the U.S. Census region
    - Northeast, Midwest, South, and West
  - **SES:** socio-economic status characteristics
    - Family income and education
  - **EMPLOYER:** employer's specific characteristics
    - Employer organization type, union, and establishment size
  - **log(PRICE) & low Income:** interaction term between price elasticity of demand and income level
    - where low Income=1 if Income<$31,812 and low Income=0, otherwise

Part II: Methodology cont.

OLS Models with robust standard errors:

1. $\log(I_i) = \alpha + \beta_1 \log(PRICE) + \mu$

2. $\log(I_i) = \alpha + \beta_1 \log(PRICE) + \beta_2 DEMOGRAPHIC + \beta_3 GEOGRAPHIC + \mu$

3. $\log(I_i) = \alpha + \beta_1 \log(PRICE) + \beta_2 DEMOGRAPHIC + \beta_3 GEOGRAPHIC + \beta_4 SES + \mu$

4. $\log(I_i) = \alpha + \beta_1 \log(PRICE) + \beta_2 DEMOGRAPHIC + \beta_3 GEOGRAPHIC + \beta_4 SES + + \beta_5 EMPLOYER + \mu$

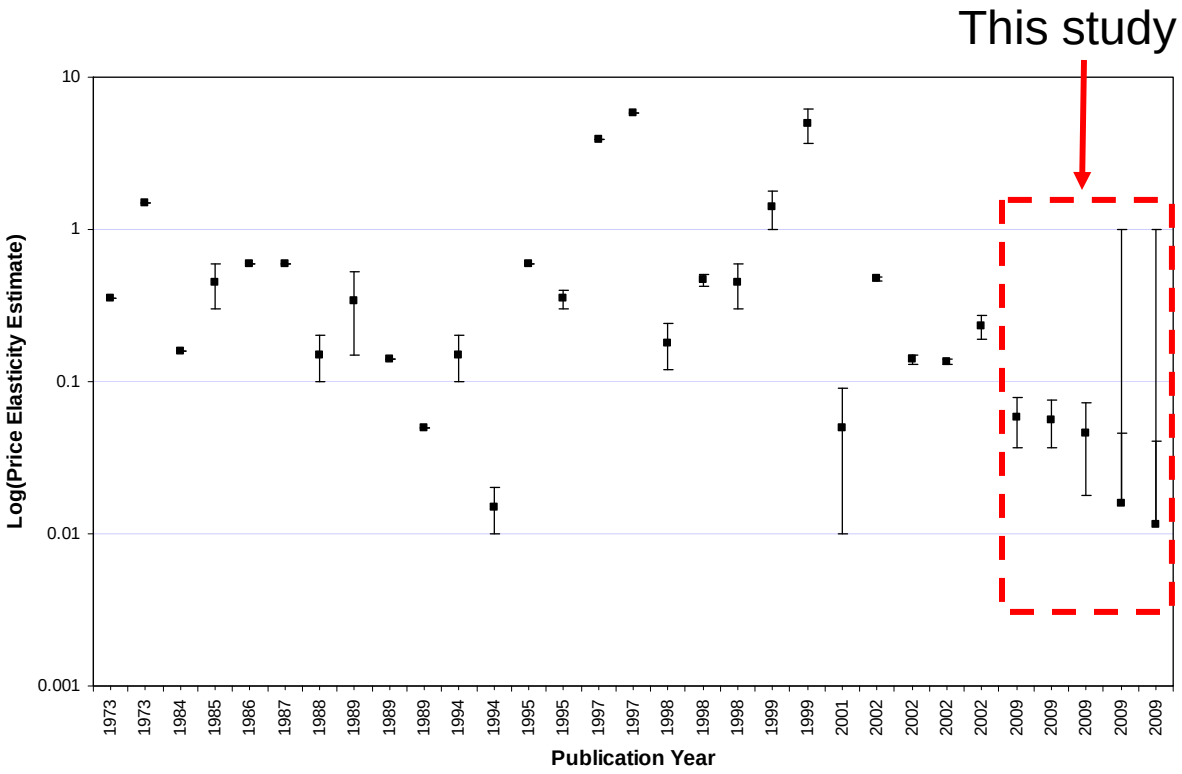
5. $\log(I_i) = \alpha + \beta_1 \log(PRICE) + \beta_2 DEMOGRAPHIC + \beta_3 GEOGRAPHIC + \beta_4 SES + + \beta_5 EMPLOYER + \beta_6 \log(PRICE) * lowINCOME + \mu$

Part II: Main Results

Price Elasticity *(95% Conf. Int.)*	*Model I*	*Model II*	*Model III*	*Model IV*	*Model V*
ln(Price)	**[-0.079,-0.037]**	**[-0.075,-0.037]**	**[-0.073,-0.018]**	**[-0.046, 0.014]**	**[-0.041,0.018]**

The price elasticity of demand of self-insured health plans is estimated to range approximately from -0.08 to 0.01

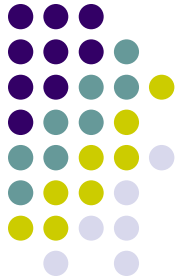
- Is not too far from other estimates (is within inelastic range) as expected
- Corresponds to the lowest range of earlier estimates



Part II: Contributions and Limitations

- Contributions
  - Examines self-insured health coverage not studied before
  - Recognizes administrative costs associated with operating self-insurance as its implicit price
- Limitations
  - Impossible to estimate price elasticity of traditional insurance
    - No information on administrative costs of conventional coverage
  - Uses relatively old dataset (1987)
  - Exists a potential endogeneity problem

Part III: Impact of Hospice Ownership and Certification Status

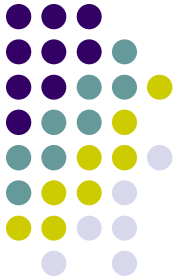


- Investigates the effects of the ownership form of hospice (for-profit vs. nonprofit) and certification status on the length of stay
- Extends previous research by
  - Accounting for factors not previously studied:
    payment sources, caregiver status, and referral sources
  - Using more detailed diagnosis types
  - Employing more advanced statistical methodology
  - Using more recent, detailed, on the patient-level, and nationally representative data
  - Providing first analysis of the impact of the certification status on the patients' length of service use

Part III: Previous Work

- Most studies found the differential behavior across the ownership forms in terms of hospice length of stay
  - Patients with very long stays (longer than 180 days) (Christakis et al. 1996 and Ohri 2007) or long expected stays (Lindrooth et al. 2007) tend to be cared by for-profit hospices
- No studies on the impact of certification on hospice care
  - However, substantial research on certification in other areas, e.g. in education
    - Inconclusive findings

Part III: Main Research Questions



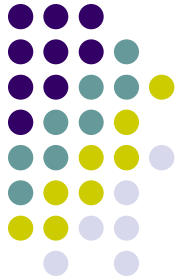
Research Question 1

- What is the impact of the ownership type of hospice on the length of hospice service?

Predicted Response 1

- Theory prediction
  - For-profit hospices select “long-stay” patients because they’re more profitable for them (Lindrooth and Weisbrod 2007) based on
    - Hospices reimbursement scheme
      - Fixed per diem basis regardless of diagnosis, duration or type of enrollment, volume or intensity of services provided
    - Hospices U-shaped cost structure
      - Patients are most expensive in the first and last days of care
      - Patients’ intermediate days are less costly

Part III: Main Research Questions



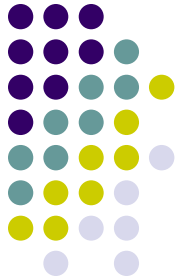
Research Question 2

- What is the effect of the certification status on the length of hospice service?

Predicted Response 2

- Patients treated at certified hospices have longer survival times, as certified agencies are commonly perceived to provide higher quality

Part III: Data and Study Sample



- The National Home and Hospice Care Survey (NHHCS) Series, Discharged Patient Dataset
  - Pooled from two years: 1998 and 2000
  - Cross-sectional and patient-level data
  - Nationally representative data
  - Home health and hospice agencies data
- Study Sample
  - Includes only patients who used hospice services
    - Excludes home health patients
  - Considers patients who died while using hospice care (88% of discharged patients)
    - Excludes patients discharged alive because they may add some endogeneity if selection bias is an issue
  - Considers 3,704 observations

Part III: Methodology

- Dependent variable

  LOS (days) or log(LOS)
  - LOS is the time from the date of the most recent admission to the date of discharge
- Main explanatory variables
  - **PROFIT:** for-profit vs. nonprofit (as an omitted variable)
  - **longLOS*PROFIT:** interaction term between for-profit and long LOS
    - Where longLOS=1 if LOS>55 days and longLOS=0, otherwise
    - longLOS defined based on the median value of the predicted LOS, which is estimated from patient's clinical characteristics (such as age, sex, race, and admission diagnosis).
  - **CERTIFICATION**
    - Certified, not certified (as a reference), or other (i.e., either pending certification or unknown status)

Part III: Methodology cont.

- Other control variables

HOSPICE

- AFFILIATION: chain-, HMO-, hospital-, nursing home-affiliated, or don't know
- LOCATION: location of care provided (inpatient, in home, or other)
- GEOGRAPHIC: Northeast, Midwest, West, and South, or MSA

PATIENT

- MEDICAL: medical related (primary admission diagnosis and referral source)
- PAYMENT: primary payment source (e.g., Medicare, Medicaid, private source)
- CAREGIVER: caregiver status (primary caregiver, no primary caregiver, or don't know
- DEMOGRAPHIC: demographic information (age, sex, and race)

- (YEAR: Year of the data used: 1998 vs. 2000)

Part III: Methodology cont.

- Negative binomial (NB) regressions with robust standard errors:

Version (a)

$$LOS = \alpha + \beta_1 PROFIT + \beta_2 CERTIFICATION + \beta_3 HOSPICE + \beta_4 PATIENT + \mu$$

Version (b)

$$LOS = \alpha + \beta_1 PROFIT + \beta_2 CERTIFICATION + \beta_3 HOSPICE + \beta_4 PATIENT + \beta_5 longLOS * PROFIT + \mu$$

- OLS models with robust standard errors applied:

Version (a)

$$\log(LOS) = \alpha + \beta_1 PROFIT + \beta_2 CERTIFICATION + \beta_3 HOSPICE + \beta_4 PATIENT + \mu$$

Version (b)

$$\log(LOS) = \alpha + \beta_1 PROFIT + \beta_2 CERTIFICATION + \beta_3 HOSPICE + \beta_4 PATIENT + \beta_5 longLOS * PROFIT + \mu$$

Part III: Methodology cont.

- Logistic regressions with robust standard errors:

$$longLOS = \alpha + \beta_1 PROFIT + \beta_2 CERTIFICATION + \beta_3 HOSPICE + \beta_4 PATIENT + \mu$$

  - where longLOS=1 if LOS>55 days and longLOS=0, otherwise

  - longLOS defined based on the median value of the predicted LOS, which is estimated from patient's clinical characteristics (such as age, sex, race, and admission diagnosis).

Part III: Main Results

y=LOS	NB Model Specifications					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Agency Ownership (Nonprofit as the reference)						
PROFIT	0.3109**	-1.1146***	0.2516**	-0.9969***	0.2458**	-0.9871***
	(0.1004)	(0.0540)	(0.0886)	(0.0610)	(0.0878)	(0.0606)
Interaction Term						
longLOS*PROFIT		2.6241***		2.5051***		2.914***
		(0.1122)		(0.1062)		(0.1069)

y=ln(LOS)	OLS Model Specifications					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Agency Ownership (Nonprofit as the reference)						
PROFIT	0.0253	-0.6705***	0.0745	-0.5901***	0.0737	-0.5866***
	(0.0639)	(0.0555)	(0.0689)	(0.0620)	(0.0689)	(0.0621)
Interaction Term						
longLOS*PROFIT		2.7496***		2.6356***		2.6254***
		(0.0702)		(0.0747)		(0.0749)

y=longLOS	Logistic Model Specifications		
	(1)	(2)	(3)
Agency Ownership (Nonprofit as the reference)			
PROFIT	1.09	1.07	1.05
	(0.10)	(0.12)	(0.11)

Statistically significant

Part III: Main Results cont.

- As expected, all models suggest a positive impact of the for-profit organizations on LOS
  - Statistically significant result in NB models, but not in the OLS models
    - Not robust across model specifications (in contrast to earlier literature)
- After accounting for differences in the patients' length of service via the interaction term (not done earlier)
  - The differential response of for-profit vs. nonprofit agencies with respect to short- vs. long-stay patients
    - Robust across model specifications
    - Patients with long expected length of hospice use have higher survival times at for-profit hospices
    - Patients with short expected length of hospice use have lower survival times at for-profit hospices
- **No evidence found of systematic selection of long LOS patients by for-profit hospices**

Part III: Main results cont.

y=LOS	NB Model Specifications					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
CERTIFICATION (Not certified as the reference)						
Certified	-0.8996***	-0.8294***	-0.7802***	-0.7795***	-1.0059***	-0.8621***
	(0.1968)	(0.1768)	(0.1595)	(0.1450)	(0.1894)	(0.1573)
Don't know	-1.7367***	-1.8853***	-1.5340***	-1.7009***	-1.7678***	-1.7736***
	0.3693)	(0.3332)	(0.4145)	(0.4151)	(0.4247)	(0.4160)

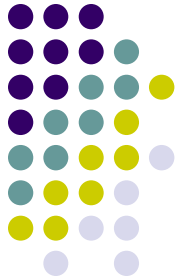
y=ln(LOS)	OLS Model Specifications					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Certification (Not certified as the reference)						
Certified	-0.5604***	-0.5953***	-0.6073***	-0.6470***	-0.7012***	-0.7316***
	(0.1378)	(0.1315)	(0.1389)	(0.1330)	(0.1790)	(0.1698)
Don't know	-1.4123***	-1.5429***	-1.5406***	-1.7309***	-1.5689***	-1.7621***
	(0.3364)	(0.3089)	(0.3880)	(0.3648)	(0.4150)	(0.3826)

All results are highly statistically significant

Part III: Main Results cont.

- In contrast to our expectations, certification is associated with shorter LOS
  - This may be translated into lower survival times at certified hospices compared to those at noncertified hospices
  - Results are highly statistically significant and robust across all model specifications

Part III: Contributions and Limitations



- Contributions:
  - Accounts for factors not previously studied:
    payment sources, caregiver status, and referral sources
    - Uses more detailed diagnosis types in the analyses
    - Employs more advanced statistical methodology than previous studies
      - E.g., tests the presence of systematic selection by including the interaction term and through the logistic model
    - Uses more recent, detailed, on the patient-level, and nationally representative data
  - Provides first analysis of the impact of the certification status on the patients' length of service use
- Limitations:
  - Possible endogeneity problem
  - Lack of control for hospice quality

Main Conclusions

- I investigated issues in health economics
  - Determinants of employer's premium contributions
  - Price elasticity in self-insured health plans
  - Impact of hospice ownership and certification on length of hospice use
- I found
  - Unionization and self-insurance predict higher employer's premium contributions
  - Price elasticity of demand for self-insurance is relatively inelastic
  - No evidence of systematic selection of long-stay patients by for-profit hospices is found
  - Patients have shorter survival times at certified hospices

Questions?