

Public Health Shocks and Product Pricing Behavior

Evidence from Life Insurance during the Influenza Pandemic

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Motivation

Conventional insurance wisdom following financial crises:

- Gron (1994) and Winter (1994): capacity-constraints?
- Kojien and Yogo (2015): financial/product market frictions?
- Ge (2021): Price decrease for those w. immediate impact
- Kim (2020): Price decrease following Lehman Bankruptcy

Overall: firms **reduce** prices following a financial shock

Froot and O'Connell (1999): prices increase d.t. supply frictions

Motivation

What happens during a public health shock?

- General problem in the field: data availability
- We turn to: 1918 - 19 Influenza Pandemic in the U.S.
- We exploit variation in exposure towards the pandemic

- We focus on life insurers:
 - Homogeneous product and "regulation"
 - Customer = debt holder
 - Arguably the most affected sector

History can help us to better understand pricing behavior

1918 - 19 Influenza Pandemic

First case was in March 1918 (in Kansas)

Second wave: November 1918

Third and fourth wave: 1919 - 1920

What makes this historical episode appealing?

- Very severe! Case-fatality ratio: 2,5 pct
- Distinct feature: it affected younger adults much more
- Also, it did not coincide with an economic downturn.

Life insurance sector

Data:

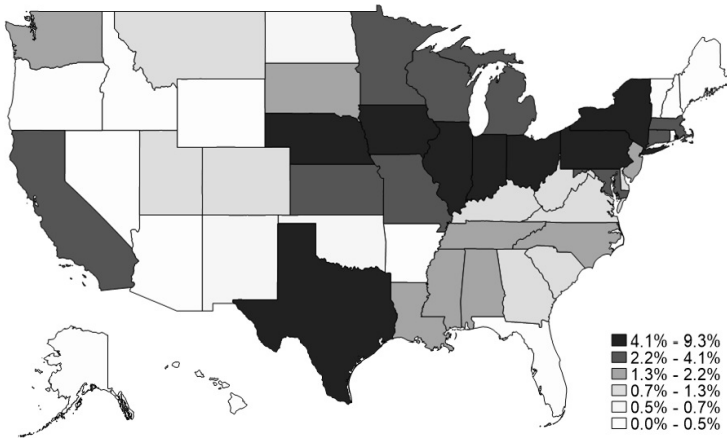
- Balance sheet: total admitted assets vs. total liabilities
- Income statement: total income vs. total disbursements
- Firm specifics: geographical diversification and retirements

Source: The Spectator

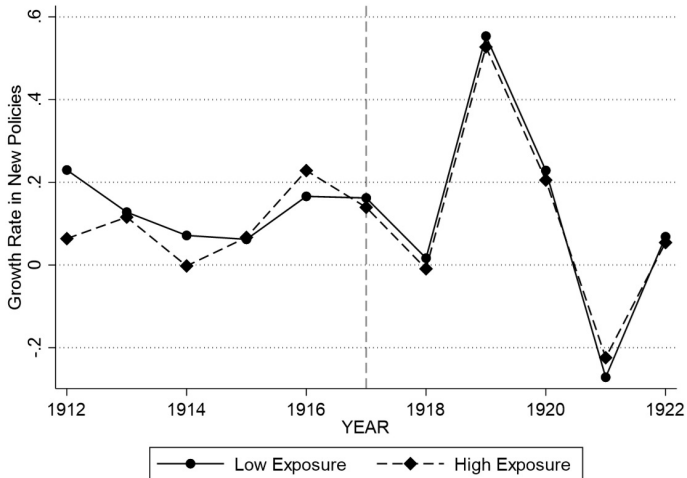
- We include: all life insurers with 1 year of data pre-1918
- We exclude: all retirements / all new incorporations
- (Secondary source: Best)

We link this with Clay et al. (2019)

Influenza Pandemic and Life Insurance



Influenza Pandemic and Life Insurance



Variable definition

Price: Value divided by the number of new contracts

- Measured in 1917 USD
- Definition: The average price of a newly-issued contract
- Summary statistics: 1,837.20 USD

It can be interpreted as a single-premium contract

It can also be interpreted as the equilibrium price

What do we do?

Difference-in-difference model

$$P_t = \alpha + \beta HighExposure_{t,i} \times Post_t + \beta Post_t + y_{t-1,i} + \varepsilon_t$$

- *High Exposure*: if insurer-level mortality is above average
- *Post*: indicator variable from 1918 onwards
- *Distance x Post*: To control for WW1 events

Additional specifications:

- Include Year and Life Insurer Fixed Effects
- Cluster standard errors at the Insurer level
- Plenty of robustness checks in line with DID literature

Difference-in-difference

	(1)	(2)	(3)	(4)	(5)
<i>Post × High Exposure</i>	0.053* (0.062)	0.054* (0.063)	0.056** (0.050)	0.062** (0.030)	0.062** (0.034)
<i>Post</i>	-0.289*** (0.000)	-0.286*** (0.000)			

R-squared	0.220	0.220	0.296	0.220	0.289
Observations	2,519	2,519	2,519	2,018	2,000
Year FE	No	No	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes	Yes

Difference-in-difference

	(1)	(2)	(3)	(4)	(5)
<i>Post × High Exposure</i>	0.053* (0.062)	0.054* (0.063)	0.056** (0.050)	0.062** (0.030)	0.062** (0.034)
<i>Post</i>	-0.289*** (0.000)	-0.286*** (0.000)			
<i>High Exposure</i>	0.033 (0.569)		0.032 (0.572)		
<i>Asset Growth</i>				0.071** (0.044)	0.063* (0.062)
<i>Size</i>				0.014 (0.589)	0.074** (0.014)
<i>ROA</i>				-0.009 (0.852)	-0.031 (0.515)
<i>Liquidity</i>				-0.057 (0.395)	-0.030 (0.594)
<i>Leverage</i>				-0.302*** (0.002)	-0.231** (0.019)
<i>GEO</i>					-0.023 (0.245)
<i>Capacity</i>					-0.008 (0.628)
R-squared	0.220	0.220	0.296	0.220	0.289
Observations	2,519	2,519	2,519	2,018	2,000
Year FE	No	No	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes	Yes

Main takeaways

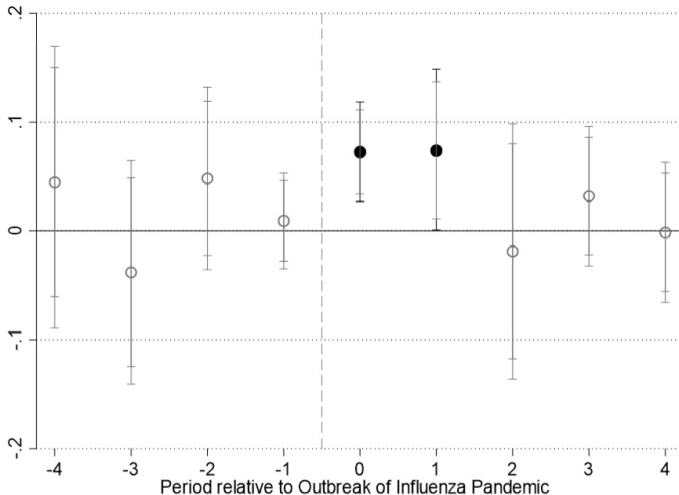
High-exposure insurer: charge higher premium prices

- This effect is statistically significant
- Economic magnitude: 117.51 USD (in 1917 dollars)

Is the effect over the entire post-pandemic period?

- We replace *Post* with year-dummies
- And test the impact of price differences for each year.

Event study approach



Follow-up questions

Robustness:

- What if we change the treatment/control group?
- What if we change the date of the Influenza Pandemic?
- What if we focus on new incorporations?
- What if we focus on metropolitan areas?

Potential explanations:

- Different types of companies?
- Financial constraints?
- Regulatory frictions?
- Policyholder's characteristics?

Type of companies

	(1)	(2)	(3)	(4)
<i>Post × High Exposure</i>	0.038 (0.228)			
<i>Post × High Exposure × Type</i>	0.036 (0.621)			
<i>During × High Exposure</i>		0.066* (0.090)		
<i>During × High Exposure × Type</i>		-0.052 (0.482)		
<i>Aftermath × High Exposure</i>		0.017 (0.600)		
<i>Aftermath × High Exposure × Type</i>		0.151 (0.122)		
R-squared	0.292	0.293		
Observations	2,010	2,010		
Controls	Yes	Yes		
Year FE	Yes	Yes		
Firm FE	Yes	Yes		
Type				
Mutual Life Insurance	Yes	Yes		
Life Insurance Only	No	No		

Type of companies

	(1)	(2)	(3)	(4)
<i>Post × High Exposure</i>			0.047 (0.100)	
<i>Post × High Exposure × Type</i>			0.262*** (0.000)	
<i>During × High Exposure</i>				0.054 (0.127)
<i>During × High Exposure × Type</i>				0.295*** (0.000)
<i>Aftermath × High Exposure</i>				0.052 (0.188)
<i>Aftermath × High Exposure × Type</i>				0.239*** (0.000)
R-squared			0.293	0.293
Observations			2,010	2,010
Controls			Yes	Yes
Year FE			Yes	Yes
Firm FE			Yes	Yes
Type				
Mutual Life Insurance			No	No
Life Insurance Only			Yes	Yes

Market frictions

	(1)	(2)	(3)	(4)	(5)
<i>Post</i>	-0.477*** 0.000	-0.309*** 0.000	-0.318*** 0.000	-0.526* (0.099)	-0.288*** 0.000
<i>Post × High Exposure</i>	0.061** (0.041)	0.068** (0.018)	0.070** (0.015)	0.067** (0.024)	0.083*** (0.003)
Additional Controls					
<i>Post × Leverage</i>	0.178 (0.127)				
<i>Post × Liquidity</i>		-0.165 (0.166)			
<i>Post × HHI Index</i>			-0.001 (0.983)		
<i>Post × Regulation Index</i>				0.191 (0.513)	
<i>Post × Risky Holdings</i>					-0.114* (0.080)

Conclusion

Public health shock impact product pricing behavior:

- **High-exposure insurers charge higher premium prices**
- It is robust to changes in the empirical design
- It holds when we control for other market frictions

Our main conclusion:

- We argue: **it is a risk management tool**
- The tool was most affected at the height of the pandemic

Thank you for your attention!

Any questions?

Public Health Crises, Product Pricing, and Risk Management

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Full paper: www.verdickt.eu