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The Effect of the 1918 Influenza Pandemic on U.S. Life Insurance Holdings

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Abstract:

This paper examines the effect of a sharp rise in mortality, the 1918 influenza epidemic, on life insurance holdings in the U.S. The BLS Cost of Living Surveys of 1918-1919 provide a unique opportunity to examine the effect of the pandemic—some households were surveyed before, and others during or shortly after the worst of the influenza outbreak. In addition, I use state-level insurance sales data to compare the increase in spending on insurance in states particularly hard hit by the epidemic, relative to those that were not. I find some evidence that, in the immediate aftermath of the epidemic, those in severely affected areas spent more on industrial insurance. They were less likely, though, to hold ordinary or fraternal policies and the effects appear to be short-lived. I consider a few explanations for the smaller-than-expected results.

Keywords: Influenza; Mortality; Life Insurance; History; Insurance

"Spanish Influenza! Can You Afford Sudden Death? If Not, Protect Your Family and Business By Life Insurance."

Ad for Ives & Myrick Life Insurance Agency

New York Times, October 1, 1918

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1. Introduction

The 1918 influenza pandemic caused immense suffering, fear, and economic disruption. In just a few months, influenza and pneumonia killed an estimated 550,000 Americans in excess of the expected mortality (Crosby, 2003). This exceeds American combat deaths from World War I, World War II, and the Vietnam War combined. In areas most affected by the epidemic, real manufacturing wages rose sharply as markets adjusted to the decrease in labor supply (Garrett, 2009). Survivors suffered persistent health effects, even decades after exposure to the disease (Almond, 2006).

In contrast to most influenza outbreaks, young adults were much more vulnerable to the 1918 strain, recently identified as an H1N1 version of the virus (Taubenberger and Morens, 2006). In the Death Registration Area, deaths from influenza and pneumonia increased from 1.7 per thousand in 1917 to 6.0 per thousand in 1918. As a result, the mortality rate from all causes increased from 14.1 per thousand to 18.0 per thousand (Bureau of the Census, 1920). Did a sudden and sharp rise in mortality, which particularly affected healthy young adults, convince many to seek out life insurance?

At this point, we know little about the effect of mortality risk on demand for life insurance. All else equal it would seem that higher mortality risk, or perceived mortality risk, would make life insurance a better bet and lead to increased demand for it. Counter to this prediction, Shawn Everett Kantor and Price V. Fishback (1996) have shown that industry accident risk did not affect the purchase of life and accident insurance in the 1917-19 period. National-level studies on the effect of mortality risk on life insurance demand, for the late twentieth century, also offer mixed results[1].

Despite its severity, the influenza epidemic was ultimately short-lived, even considering a flare-up in the spring of 1919. Thereafter, mortality continued its long-term decline. If households rationally considered life insurance before the epidemic, and anticipated that the mortality effects would be short-lived, there would be no need to reconsider insurance coverage during or after the epidemic. However, we might expect that households do not always consider life insurance rationally. Life insurance is somewhat unusual for a consumer good or service in that it is unpleasant to buy—one must consider one's own mortality or that of loved ones. For this

[1] For example, Browne and Kim (1993), Li et. al. (2007).

reason, some may put it off, underinsure, or avoid buying insurance altogether. Hence the industry's reliance on a sales force and advertising to help consumers overcome this reluctance. Walter H. Zultowski (1979) reports on over a dozen studies dating from 1928 indicating that only 15-35% of insurance buyers report having initiated contact with an agent. Insurance agents typically report an even lower estimate of the proportion of sales that are client-initiated. To the extent that consumers put off or avoid life insurance, we might expect an epidemic could shock many consumers into action.

In addition, perhaps shocks to mortality, like the influenza epidemic, have a larger impact on life insurance demand than accident risk or overall mortality. There is some evidence that people respond to disasters by purchasing more insurance. Economic geographer Risa Palm (1995) surveyed California homeowners in 1989, 1990 and 1993 on their perceived risk of loss from earthquakes and purchase of earthquake insurance. She finds that *actual* risk, as measured by distance to an active fault, is unrelated to take-up of earthquake insurance. However, *perceived* risk of loss is consistently related to the purchase of earthquake insurance. Perceived risk and purchase of earthquake insurance increased dramatically among those who experienced the Loma Prieta earthquake in 1989. Perhaps earlier generations similarly responded to the 1918 influenza epidemic by buying more life insurance. In addition, even as actual mortality risk returned to normal, perceived risk may have increased if the epidemic caused a lack of faith in medical progress in general.

In looking for an empirical relationship between influenza mortality and life insurance holdings, we might expect the effect could vary with the type of life insurance. Several types of life insurance were available at the time, and they were generally used for different purposes. Ordinary and fraternal insurance typically provided a large amount of coverage for breadwinners, while industrial insurance provided less coverage for more members of the family. Essentially burial insurance, industrial insurance frequently covered women and children. We know much about the buyers of fraternal insurance, thanks to the work of George Emery and J.C. Herbert Emery (1999) and David T. Beito (2000). Recent work by John E. Murray (2007) sheds much light on industrial sickness insurance, which usually also paid a small death benefit.

In this paper, I use the 1917-19 Cost of Living Surveys to estimate a flu effect on holdings and spending on different types of life insurance. Both Robert Whaples and David Buffum (1991) and Kantor and Fishback (1996) have used Cost of Living Surveys to examine the probability of holding life insurance, in 1889 and 1917-

19, respectively. However, they do not break down the analysis by the different types of life insurance, nor do they look specifically for the effect of a mortality shock[2]. To supplement and extend the Cost of Living data, I also analyze state-level insurance sales data to see if sales increased more in those states particularly hard hit by the epidemic, relative to those that were not.

2. Early Twentieth Century Life Insurance

In the early twentieth century, life insurance provided a popular means to protect young families from the financial consequences of death. By 1918, 85% of middle-class households surveyed by the Bureau of Labor Statistics reported holding at least one life insurance policy (Kantor and Fishback, 1996). In 1917, ordinary insurance was the most popular, representing nearly 60% of the life insurance in force in U.S. companies (Stalson 1942, 822). Ordinary insurance was the earliest type commercially available, with premiums due annually, semi-annually, or monthly. Coverage was typically in the thousands, and these plans frequently paid dividends which could be paid in cash (effectively reducing the premium), used toward paid-up insurance, or used toward building a surrender value (Stalson, 1942; Huebner, 1919). The dividends provided a second potential purpose for purchasing life insurance beyond the death benefit—the policy could be used to build a nest egg through regular contributions. This savings function was apparently highly valued by consumers[3]. Although term insurance was available, and much cheaper than whole life or endowment plans, few bought it. In 1920, for example, 73% of the ordinary insurance in force was whole life, 20% was endowment, and the remainder other variations including term insurance (U.S. Department of Commerce 1924, 284). Coverage was typically subject to passing a medical exam.

Life insurance was also provided by some fraternal orders. Herb Emery (2001) classifies fraternal orders that provided benefits into two types: Friendly societies, which typically offered sickness benefits and a small

[2] From the 1889 data on Michigan furniture workers, Whaples and Buffum cannot tell what type of insurance is held. Kantor and Fishback have access to data on different types of life insurance from the 1917-19 survey, but largely examine the purchase of any type of life insurance policy. Also, given their interest in workers' compensation laws, Kantor and Fishback limit the sample to those with high-risk occupations.

[3] Ransom and Sutch (1987) show that tontine insurance policies were very popular until their sale was prohibited in 1906. After this prohibition, consumers continued to value participating policies that built a cash value or included an endowment feature. This may be due to the fact that the insurance company could invest in a diversified portfolio of real estate, bonds, and stocks in a way that few families could afford to do on their own.

funeral benefit; and Life-insurance orders which offered stipulated life insurance, endowment, and annuity benefits. The amount of life insurance coverage varied, but life-insurance orders could provide large amounts of coverage, generally at a lower cost than ordinary insurance companies. In part, this may be because fraternal organizations were less likely to offer participating policies. They may have realized some efficiencies from reducing adverse selection, and until 1912, faced little regulation in terms of reserve requirements (Emery and Emery, 1999).

Industrial insurers sold smaller policies, generally for burial expenses, to the lower and middle classes. The premiums were collected by door-to-door salesmen weekly. These were very popular policies for women and children—by one estimate these groups represented 70% of the policyholders (Pedoe and Jack 1978, 438). While these policies represented a small amount of the total life insurance in force (14%), in terms of the number of policies, industrial insurance represented the majority of policies in force. Instead of requiring a medical exam, industrial insurers generally paid only half of face value if death occurred within six months of taking out a policy. (Huebner 1923, 291).

After 1911, a few large firms made insurance available to their employees. Group or establishment insurance represents insurance that covers a number of people, typically employees, under a single contract. Though growing rapidly, this insurance was still in its infancy in this period—representing only 0.1% of the total life insurance in force in 1917 (Stalson 1942, 804).

While troops were mobilized beginning in April of 1917, War Risk Insurance was briefly an important source of life insurance. The War Risk Insurance Act provided payments of $25 per month to qualifying war widows, and additional payments for additional dependents and disabled veterans. This coverage was automatic upon enlistment. In addition, soldiers and sailors could elect to take out an additional $1,000 to $10,000 in life insurance, offered at peacetime rates, with premiums deducted from pay (U.S. War Office, 1918). As a result, the U.S. government was for a short time the largest insurance company in the country. Although War Risk policies were convertible into ordinary life, most veterans dropped the coverage shortly after the war (Stalson 1942, 571; Buley 1967, 846).

Figure 1 shows the percentage change, over the previous year, in the face value sold of ordinary and industrial insurance, from 1908 to 1929 by U.S. companies. There is a clear surge in life insurance sales in 1919

and 1920, particularly for ordinary insurance. Insurance executives and state insurance officials thought 1919 was a banner year for selling life insurance, and largely credit the epidemic for it. Thomas F. Tarbell, state actuary for Connecticut, reported that greatly increased business in the first half of 1919 was "a matter of common knowledge among insurance circles." By means of a survey of the 32 life insurance companies operating in the state of Connecticut, Tarbell estimates a 79% increase in life insurance written in the first six months of 1919, relative to the first six months of 1918. Similarly, the fraternal societies in the state reported an 84% increase in life insurance written (Tarbell, 1919). The Eastern Underwriter (March 21, 1919) reported that "companies have been writing new insurance on an unprecedented scale, without making any drive to get it. The companies went through the epidemic in such fine shape that men and women who never thought much about insurance apparently have got the habit."

Despite the unusually high number of claims, few insurers failed in the wake of the epidemic. Prior to the epidemic, life insurers had been accused of using old mortality tables that predicted unrealistically high death rates. Many companies realized actual mortality rates less than 90% of expected rates. Even as mortality ratios increased (for Prudential from 86.4% in 1917 to 143.7% in 1918; for Kansas City Life from 44.9 to 101.7%) these companies were well positioned to weather the storm with minor rate increases (Bell, 1997). A few insurance companies failed in late 1918 and 1919, and were absorbed by other insurers. The number of firms involved in these mergers (12 in 1918, 7 in 1919) was consistent with the number of failures in non-pandemic years, which averaged 12.75 for the years 1910-1917 (Best's Life Insurance Reports, 1920).

The 1919 increase in life insurance sales appears to be driven more by demand than supply. If supply was the decisive factor, we would expect to see prices and insurance company profits declining in this period. Instead, most insurers held rates constant or increased them slightly in 1919 and 1920. For example, the largest insurer in the country, Metropolitan Life, held premiums on its most popular policies (20 payment life and 20 year endowment) constant from 1917 through 1919. By 1920, premiums for a 25 year old increased by 7.66% and 6.45%, respectively. Meanwhile, dividends for existing policies were eliminated in 1919, effectively increasing the price of existing participating policies by 12-16%. At New York Life, premiums remained constant and

dividends remained consistent throughout the period from 1917 to 1920[4]. Tarbell (1919) reports that three of 31 Connecticut insurers raised premiums in 1919, and an additional seven reduced dividends. 12 of 32 fraternal societies raised rates or levied a special influenza assessment.

Premium income from life insurance for U.S. companies increased 21% in 1919 and another 16% in 1920 (White, Table Cj728). Underwriting profit for stock companies increased from $20 million in 1918 to $51 million in 1919 (White, Table Cj795). Increases in premiums, premium income, and underwriting profit all point to demand as the main source of the surge in life insurance sales in 1919. But can we attribute that increase in demand to the influenza epidemic?

Tarbell notes several possible reasons for the increase in new business in early 1919 including: the epidemic, the advertising of life insurance provided by War Risk Insurance, general prosperity, inflation, the rise of group insurance, and the corporation and inheritance tax. Of these factors, he surmises that, "general prosperity is in the lead, with influenza and government insurance running a close second" (Tarbell, 1919, 309).

Tarbell is likely correct in considering inflation, group insurance, and the estate tax as relatively minor influences on the surge in insurance sales in 1919. Despite the rapid inflation at the time, it is unlikely that policyholders frequently adjusted their coverage for inflation. White's series shows that the average size of ordinary policies in force increased only slightly, from $1840 to $1860 between 1918 and 1919. However, there was a more substantial increase to $1990 in 1920. (White, Cj720). Inflation might explain the 1920 increase in average policy size, as households eventually responded to inflation. Group insurance, while growing rapidly, still only represented about 3% of U.S. life insurance in force in 1919 (White, Cj717). Thus, it is hard to imagine that increasing group coverage could have stimulated demand for other types of insurance that much. The Revenue Act of 1916 created an estate tax of 1% to 10% on estates exceeding $50,000 (Jacobson, et.al, 2007). Since life insurance proceeds are not taxable to the beneficiary, the estate tax encourages the wealthy to convert taxable estates into nontaxable insurance proceeds. However, at the time, the $50,000 threshold would have applied only to the very wealthy—taxable estates were involved in less than 1% of all adult deaths (Jacobson, 125). As Tarbell suggests, rising income, publicity from War Risk insurance, and the influenza epidemic remain

[4] National Underwriter Company, Unique Manual-Digest of American Life Insurance, 1917, 1919, 1920.

as the most likely causes of the surge in life insurance demand in 1919.

3. The 1918-19 Influenza Epidemic

The first wave of the influenza epidemic arrived in Kansas in the spring of 1918. Although illness rates were high, and some cases rapidly progressed to fatal pneumonia, death rates were not much higher than normal. The first wave went largely unnoticed by all but a few organizations, like army camps and prisons, which had complete control of their members and some responsibility for providing health care. A few pathologists noticed differences in the lung tissue of victims, but did not realize the significance until the second wave in the fall. As the first wave disappeared in the U.S., it struck Europe, affecting military operations during the summer of 1918 (Crosby, 2003).

The second, more deadly, wave of influenza first appeared in the U.S. at Commonwealth Pier, Boston, in late August of 1918. While it is not known whether the two waves were caused by the same virus, it is possible the virus mutated profoundly into a form against which few had immunity, and of course, there was no treatment (Taubenberger and Morens, 2006). The disease spread within three weeks to Denver and cities along the Mississippi River. Within four to seven weeks, interior and West Coast cities were affected (Eggo, Cauchemez and Ferguson, 2011). In most cities, deaths from influenza and pneumonia peaked in September or October 1918, before quickly returning to near-normal. Some cities, like Philadelphia, struggled with the rapid increase in mortality, and briefly could not pick up and bury the victims in a timely manner. Many coastal cities attempted to quarantine new arrivals. Several cities closed schools, churches, and other places of entertainment for weeks. Some cities, like San Francisco, enforced mask laws for people in public. It is unlikely that these public health measures had much effect on mortality, as they were frequently enacted after influenza had appeared, or were unevenly enforced (Crosby, 2003).

Mortality from the influenza epidemic was widespread, yet variable. Among 50 registration cities with population of 100,000 or more in 1920, the highest mortality rate from influenza and pneumonia was suffered by Pittsburgh, at 12.4 per 1000 (vs. 3.8 per 1000 in 1917). The lowest mortality rate occurred in Grand Rapids, Michigan, at 2.8 per 1000 (vs. 0.9 per 1000 in 1917). The most affected states (Pennsylvania, Montana, Maryland, and Colorado) had little in common geographically or economically. However, Karen Clay, Joshua

Lewis and Edson Severnini (2018) show that air pollution from coal-fired power plants contributed significantly to mortality during the epidemic. Neighboring communities sometimes suffered at vastly different rates—the mortality rate in St. Paul was 70% higher than in neighboring Minneapolis. Elizabeth Brainerd and Mark A. Siegler (2003) argue that differences in influenza and pneumonia mortality rates cannot be explained by state-level income, geography, or climate. Thomas A. Garrett (2008) finds that 1918 mortality was related to population density and race, but not as much as in 1915.

One of the few ways that people could respond to the epidemic was to adjust life insurance coverage. We can look deeper for an influenza effect on life insurance by more precisely examining consumer behavior at the household level, in the few months before and after the epidemic.

4. 1918-19 Cost of Living Surveys and Mortality Data

Household-level data on the purchase of life insurance may be derived from the cost of living surveys conducted by the U.S. Department of Labor in 1918-1919. This survey covered the families of wage and salary workers in 92 cities across the country. Most of the cities sampled were quite large—47 had a population greater than 100,000 in 1920, and another 31 had a population larger than 25,000. The purpose of the survey was to collect consumption and price data to use as the basis for wartime wage adjustments. Respondents were approached by door-to-door surveyors. Eligible respondents were households composed of at minimum: husband, wife and one child. Further restrictions include a salary limit of $2000 (but no limit on wage or other earnings), no "slum" or "charity" families, and no families living in the U.S. for less than five years. This survey provides a great deal of detail with regard to family income and expenses, including: specific expenses on food, clothing for each member of the family, entertainment, and other expenses including life insurance premiums. Of course, since detailed questions were asked on income and purchases for an entire year, the responses are subject to recall bias (BLS, 1918). Survey respondents were asked the number of life insurance policies they owned, their amounts, and the premiums paid for four types of life insurance: ordinary or "old line", industrial, fraternal, and group.

Of the 12,818 families surveyed, 11,023 report paying premiums on one or more life insurance policies. Table 1 summarizes the coverage and cost reported by families for different types of insurance. Ordinary and

fraternal insurance policies provided the most coverage, at a median of $1,000, most likely just for the breadwinner of the household. While a decent sum, $1,000 was not enough to maintain a family's standard of living very long, given that median husband's earnings was $1,296. Fraternal plans provide a similar level of coverage at a lower cost than ordinary insurance companies, although this may in part reflect that ordinary plans are more likely to include an additional investment component. Industrial policies provided a smaller amount of coverage, for more members of the family. Similarly, group insurance policies provide a small amount of coverage at low cost, however, these plans are reported only by a small fraction of the respondents.

In looking for a surge in life insurance demand from the influenza epidemic, I divide the respondents according to the month surveyed. Each respondent was asked to provide details on income and spending for the previous year, ending with the last day of the month preceding the date of the survey. The earliest cities surveyed cover the year ending July 31, 1918. The latest surveys cover the year ending February 28, 1919. I consider the earliest surveys, covering the years ending July 31, August 31, and September 30, 1918 to be Pre-flu, since they cover spending from just before to the beginning of the deadly second wave of the influenza epidemic, which first appeared in the U.S. in late August. Recall that mortality from the epidemic peaked in most cities in September or October. However, it is likely that many remained unaware of scale of the epidemic until well into September.

A review of the New York Times indicates that through September 15, the only articles on influenza involved issues on ships and at army bases. One could conclude, at this point, that the problem was contained to those areas. However, by September 17, there are mixed messages in the article "Close Camp Upton to Check Influenza." Despite "no deaths, not even any very serious cases," the army camp was closed and in addition, 16 deaths in six hours were reported for the Greater Boston area. By September 21, it is clear that influenza is spreading in New York and elsewhere[5].

The later surveys, covering the periods up to October 1918 through February 1919, are considered Post-flu. It is important to note that those households that recently suffered the loss of husband, wife, or only child would not be included in the survey, given the requirements for participation. Although such directly affected households are excluded, we expect that by October everyone would be aware of the risk of influenza through

[5] Sept. 21 p. 7, "31 New Influenza Cases in New York"; Sept. 25, p. 24 "Influenza Spreads, 150 New Cases Here"; Sept. 27, p. 6, "Bay State Asks Aid in Influenza Fight."

newspaper reports, public health measures, and the deaths of friends or acquaintances.

Table 2 shows differences in life insurance holdings for the households surveyed in the pre-flu and post-flu periods. At first glance, there does not seem to be a rush to buy life insurance once the worst of the epidemic hits. In fact, the proportion holding any life insurance policy falls slightly. It is important to note, though, that the pre-flu (earliest surveyed) cities were concentrated in the East, Midwest, and Pacific regions. In fact, the pre-flu observations are heavily influenced by results from New York City, Pittsburgh, and Baltimore which account for more than 35% of the pre-flu observations.

Table 3 shows the regional distribution of households surveyed, by the month the survey was conducted. Region matters in the purchase of life insurance. We know from the Kantor and Fishback (1996) study of the effects of state workman's compensation laws on insurance demand that families in the northern and eastern regions were much more likely than those in the West to buy life insurance. This may in part reflect differences in the concentration of life insurance companies and agencies, the cost of insurance, and the mortality rate. Hence, the regional makeup of the pre-flu and post-flu samples may explain why we see a decline in insurance coverage after the influenza epidemic. Ideally, we would have random samples of families, from throughout the country, taken before and after the epidemic. Unfortunately, that is not how the surveys were conducted. To limit this selection effect, in the analysis below for the most part I consider only those regions that were widely surveyed both before and after the epidemic. This limits consideration to the New England, Mid Atlantic, South Atlantic, East North Central, and Pacific regions (see Table 3). This still encompasses 72% of the surveys, and limits the number of observations that are dropped due to lack of mortality rates.

Note also that the last few columns of Table 3 shows the overall distribution for all months of the survey, compared to the overall population at the time. While the Bureau of Labor Statistics made some effort to include urban families throughout the country, it appears that some regions like New England and Pacific were oversampled in the Cost of Living survey. Others, like the Mid-Atlantic region, were undersampled relative to the overall population.

4.1 Variables and Predicted Effects

In investigating how various factors, like the influenza epidemic, affected demand for life insurance, we

could consider a few different dependent variables. From the Cost of Living surveys we can find how many insurance policies families held of each type (ordinary, fraternal, industrial, group, and other). So, we can use a binary variable for whether a family holds one or more policies of each type as the dependent variable.

Spending on each type of life insurance and the amount of insurance coverage could also be considered as dependent variables. Unfortunately, due to the substantial savings component of most policies, spending on insurance does not seem to be a good representation of insurance coverage. Hence, I only consider spending as a dependent variable when investigating industrial insurance. Although the amount of insurance coverage would be an ideal dependent variable, these data seem somewhat unreliable considering that about 20% of respondents who report holding policies and spending on insurance also report zero insurance coverage. This problem is most severe for industrial policyholders, probably because this insurance was typically "adjusted to the unit of premium" (Huebner 1923, 288). This means that the amount of insurance obtained for a given premium (generally a multiple of five cents per week) varied with age and frequently provided odd-figured insurance amounts. Many likely did not know the precise amount of coverage they had at any given time. Although ordinary and fraternal policies generally provided standard coverage amounts, in these cases, families may have simply misunderstood the question or mistaken it for the cash value of the insurance. In either case, we will consider insurance coverage, for those who appear to have reported it correctly, as a supplement to our analysis of the binary dependent variable.

Our main independent variables of interest are: an indicator variable for post-flu, a measure of flu severity, and an interaction between post-flu and flu severity. Recall that we are considering surveys that measure spending through October 1918 or later to be post-flu observations. The coefficient on the post-flu variable will provide the overall time trend in the take-up of insurance or insurance spending.

Mortality rates are used to measure flu severity, however, they are only available in the death registration area. City-level death rates are available for large cities with populations of 100,000 or more in 1920. State-level death rates can also be obtained for smaller cities in one of the registration states. In 1917, 27 states were in the registration area, meaning they had consistent reporting of deaths and provided such data to the Census (Bureau of the Census, 1922). The death registration area covered most of the East and Midwest, but the South and West were not as well represented. Table 4 shows the number of cities and households in the Cost of Living surveys

where reliable city-level, state-level, or no mortality rate is available from census reports. Unfortunately, we will have to dismiss observations where we have no reliable death rates, and this will disproportionately exclude observations from the South. Many southern cities are excluded anyway, though, when we limit the analysis to just those regions surveyed both before and after the flu.

One measure of flu severity is an indicator variable for a large increase in the mortality rate from all causes from 1917 to 1918. For the cities in the survey with available mortality rates, the average increase in mortality was about 30%. Therefore I use a 40% or greater increase in mortality as an indication that a city suffered particularly severe mortality from the epidemic. As an alternative measure of flu severity, I use the city's mortality rate from all causes in 1918. This is less specific to the epidemic, and an indication of the effect of overall mortality risk. The coefficients on these variables will provide the effect of living in a severe flu area (or high mortality area) on insurance take-up *prior* to the epidemic. Most important, for our question, is the effect of the interaction variable between post-flu and flu severity. This will indicate whether the increase in insurance take-up was significantly higher after the epidemic, in more severely hit regions, relative to the less severe regions.

In addition, we can control for several household-level variables that may affect the demand for insurance. These variables and their predicted effects are summarized in Table 5 below. For all types of policies, husband's age is predicted to have a quadratic effect, and number of young children is predicted to have a positive effect, on the probability of owning a policy. For the rest of the variables, the predictions are consistent with the general purpose of the type of life insurance. Ordinary and fraternal policies are generally purchased by the wealthy to protect the earnings of the household head, but the earnings of other members of the household could provide a substitute. In contrast, industrial insurance was generally purchased by poorer households to cover the funeral expenses of the wife and children, but earnings of the household head could provide a substitute. Finally, regional dummies are included to account for differences in population density, supply, and other factors that may influence insurance demand.

4.2: Results

Table 6 shows the estimated coefficients and clustered standard errors for an ordinary least squares

regression on industrial insurance spending. The first column includes only the difference-in-difference variables, while the second column includes household and regional controls. In Panel A, the interaction variable indicates that households surveyed after the flu in severe-flu areas spent significantly more on industrial insurance--about $6 more, relative to median spending of $23, once controls are included. The coefficient on the post-flu variable indicates that the overall trend was to spend less on industrial insurance after the flu. The coefficient on the severe variable indicates that those living in severely affected areas tended to spend less on industrial insurance prior to the flu. The coefficients on the control variables are consistent with our expectations for industrial insurance. Panel B of Table 6 shows similar results when the mortality rate for 1918 is used as our measure of flu severity. Each additional death per thousand added about $0.72 in spending on industrial insurance for those surveyed after the flu.

For ordinary and fraternal insurance, spending on insurance is not an appropriate measure of insurance coverage since much of the premiums typically went to a savings component of the policy. For these types of insurance, I use a dummy variable for one or more policies, and insurance coverage (excluding those who reported a policy and a zero coverage amount). In table 7, I use indicator variables for holding one or more industrial, ordinary, or fraternal policy as the dependent variable. The coefficients are from ordinary least squares regressions, and the standard errors are clustered by city. Other than a significantly negative effect of young children on ordinary insurance, the coefficients on the control variables are broadly consistent with our expectations. In column 2, we see that those surveyed after the flu and living in severe flu areas were somewhat more likely to hold industrial insurance, though this is significant only at an 83% level of confidence. In contrast, these households were somewhat less likely to hold ordinary policies and significantly less likely to hold fraternal policies. These results are largely unchanged when we use the mortality rate as our measure of flu severity, and when we use probit specifications. Using insurance coverage as the dependent variable also leads to similar results.

There are a few reasons we might expect the flu epidemic would have a larger effect on industrial insurance than ordinary or fraternal insurance. First, as pure insurance with no savings component, it should be more affected by the disease environment. Second, it was easy to quickly obtain more from door-to-door salesmen. In contrast, ordinary and fraternal insurance was typically subject to a medical exam. Still, it is

unexpected that households in severely affected areas would be *less* likely to hold ordinary and particularly fraternal insurance after the flu. Particularly when we consider the large increase in ordinary and fraternal insurance sales that occurred in early 1919.

The overall trend for fraternal policies, given by the post-flu variable, is toward more policies. This effect was more than offset by the negative effect of living in severe-flu areas. These areas may have suffered more disruptions that delayed households seeking more fraternal coverage. In addition, perhaps the surveys simply do not provide a long enough time period to see the surge that we were expecting.

4.3 Sensitivity Analysis

One concern with our analysis of pre-flu and post-flu surveys is the possible effect of the military draft. In the pre-flu period, many household heads were at war. Only households with husband, wife, and at least one child living at home were surveyed. Thus the pre-flu sample may include many household heads ineligible for military service for medical or other reasons. If these household heads were less healthy, we might expect they were more likely to hold life insurance. This selection issue could cause an apparent decline in fraternal insurance holdings, for example, as samples of less healthy men are replaced by healthier men.

One way to limit the selection issue is to limit our sample to households headed by older men. The first two draft registrations, in June 1917 and June 1918, covered men aged 21-31. The third registration in September of 1918 was for men up to age 45 (National Archives, WWI Registration Cards). Thus, throughout the war, men older than 45 were not subject to military draft. If we limit our sample to households headed by men over 45, living in regions widely surveyed both before and after the flu, this limits the number of observations to 1375. Again, the results are fairly similar—although the interaction variable loses significance for the likelihood of holding ordinary policies, it remains significantly positive for spending on industrial insurance, and significantly negative for the likelihood of holding fraternal policies.

Another concern with our analysis is our assumption, throughout, that the effect of all the control variables remained consistent in the pre- and post-flu period. If these differ for some variables between the pre-flu and post-flu samples, it may indicate selection issues, or that the epidemic affected household responses to these variables. Table 8 shows means, coefficients, and standard errors for regressions on industrial insurance

spending, estimated separately for the pre-flu and post-flu samples. Here the mortality rate for the pre-flu sample is the mortality rate in 1917, and for the post-flu sample I use the mortality rate in 1918. Only for the mortality rate variable (along with the number of young children) do the means and coefficients change significantly between the pre-flu and post-flu samples, indicating that the post-flu households became more responsive to the mortality rate. This effect shows up again in table 9, where the dependent variable is a dummy for holding one or more insurance policy. And we also see again that the mortality rate positively affected industrial insurance holdings after the epidemic, but had a negative effect on fraternal insurance holdings.

5. 1916-1923 Spectator Yearbook Life Insurance Sales Data

Analysis of the cost of living surveys allows us to see the consumer response to the influenza epidemic only during a short time window. While influenza mortality peaked in October 1917, the cost of living surveys covered the period from July 1917 to February 1918. To extend the analysis, we can examine the annual insurance sales data published by the Spectator Company. Spectator provides annual data on insurance in force, ordinary insurance written, and industrial insurance written by each insurance company, in each state. This data is derived from the annual reports required by state insurance commissions, although Spectator notes, "a few States do not supply this information, and in such cases we have applied to the companies for particulars" (Spectator 1918-19, 343).

From the Spectator Yearbooks, I have collected a panel of new life insurance written, by state, from 1916 to 1923. The amount of insurance written in each year is inflated to 1982-84 dollars using the CPI (Williamson, 2019). We might predict that real insurance written in a state in a particular year would vary with the state's population, urbanization, per capita income, enlistment rate, mortality rate, and fixed regional and year effects. Annual state population and urbanization rates are extrapolated from census data. State income estimates are infrequently available, so throughout I use Easterlin's estimates for 1919-21, again inflated to 1982-84 dollars using the CPI (Easterlin, 1957). The enlistment rate from April 1917 to October 1918 is included to look for a promotional effect from War Risk Insurance (U.S. War Office, 1919). State mortality rates are available annually, but only for those states in the Registration Area.

Pooled cross section estimates for these data are reported in Table 10. For both ordinary and industrial

insurance, log real insurance written increases with population and urbanization. As we might expect, log real income per capita has a positive effect on ordinary insurance, but not on industrial insurance. The enlistment rate does not affect insurance written, once we control for region. The mortality rate positively affects industrial insurance written, but does not affect ordinary insurance written. This seems consistent with our earlier results from the cost of living surveys. The magnitude suggests that each 1 per 1000 increase in the mortality rate is associated with about a 10% increase in real industrial insurance written.

One potential issue with our pooled cross section analysis is the possibility of unobserved state effects that may be correlated with flu severity. These might include, for example, local attitudes toward life insurance and patriotism. In areas where life insurance is viewed more positively, we might expect such attitudes would attract more agents and advertising, which could also contribute to the spread of influenza. Similarly, more patriotic attitudes could lead to higher enlistment, which could in turn bring more flu home. Such effects would render our estimates biased and inconsistent (Wooldridge, 2013).

To overcome this issue, we will assume that these effects are fixed over time, and difference them away by estimating the *change in* insurance written from one year to the next. Accordingly, we'll also difference the explanatory variables to see if states that suffered a large increase in mortality had a large increase in new insurance written, relative to similar states that did not. This differencing procedure will cause us to lose variables that do not change in our data, like real income per capita and the enlistment rate. In essence, we must assume that these and other differences between states are fixed over time.

Results from regressions of the change in log real insurance written on changes in the mortality rate, population, urbanization rate, and fixed year effects are reported in Table 11. The coefficients on all the change variables are relative to the change from 1916 to 1917. Here, we are most interested in the interaction between the year and the change in the mortality rate from the previous year. We might expect particularly large effects from the change in mortality in 1918 and 1919, around the period of the flu epidemic. The fixed year effects are also of interest, since they provide the overall trend over time in insurance sales.

There are a few significant effects on the interaction variables, most notably in 1918 for ordinary insurance. The coefficient indicates a 2.6% increase in real ordinary insurance written from a one percentage point increase in the mortality rate from 1917 to 1918. This effect looks small, though, relative to the overall

trend for 1918 which was large and negative for ordinary insurance. In 1919, the trend for ordinary insurance was large and positive, yet we cannot attribute this to the change in mortality. Similarly, for industrial insurance, there is a small negative effect on the interaction variable for 1918, but this appears small relative to the overall positive effect of 1918.

In most years, other than 1918 and 1919, the mortality rate steadily declined from the previous year. Perhaps using the change in mortality from one year to the next is not the best way to look for lingering effects of the flu epidemic on take up of insurance. I have conducted a similar analysis using the change in an interaction between the year and whether a state suffered severe flu mortality (greater than 40% increase in mortality from 1917 to 1918). In this specification, none of the interaction variables have a significant effect on real insurance written. This indicates that the amount of insurance written was not significantly higher in severe flu states, relative to milder flu states, in the years immediately following the epidemic.

6. Conclusion

This paper investigates the cause of a surge in demand for life insurance in early 1919. Relative to 1918, sales of ordinary insurance increased by 80% and sales of industrial insurance increased 15%. However, the apparent source of the surge varies by the type of insurance. I find some evidence that spending on industrial insurance increased more in areas more severely affected by the epidemic. Industrial insurance typically covered funeral costs for women and children, and had little investment value, so it seems reasonable that demand for these policies would be more sensitive to mortality risk. In addition, the door-to-door agents and lack of a medical exam made it easy to quickly pick up more industrial coverage. Also, the mortality rate consistently, or more strongly, affected industrial insurance only after the influenza pandemic. This lends support to the idea that shocks to mortality have a larger effect on insurance than overall mortality. Our results from the cost of living surveys suggest that the four per thousand increase in the mortality rate could be responsible for increasing the probability of holding industrial insurance by about 7%. While not a monumental increase, this goes a long way toward explaining the 15% increase in industrial insurance sales.

In contrast, the holding of ordinary policies was not affected by the disease environment. While we expected a larger effect for industrial insurance, it seems a little strange that there is no effect for ordinary

insurance, especially given the even stronger gain in sales. In the immediate aftermath of the epidemic, holdings of fraternal insurance were significantly lower in areas more affected by the disease. Recall that the Cost of Living Surveys only capture a small window of time immediately before and after the worst of the flu epidemic. The lack of positive effects on ordinary and fraternal insurance might be explained by the fact that such insurance was more difficult to obtain particularly considering the disruptions of the epidemic. Many were either convalescing or caring for convalescents for weeks or even months. Public health restrictions may have further made obtaining a medical exam difficult for a considerable period following the first appearance of the epidemic.

To look for lagged effects of the epidemic, we examine panel data on new life insurance written by state. Here, we see no noticeable effect of a large change in the state mortality rate on the change in new insurance written from 1918 to 1919 or any other year in the early 1920s. This holds for both ordinary and industrial insurance. Any effect on industrial insurance that we found in the immediate aftermath of the epidemic appears to dissipate very quickly. We cannot rule out, though, that state-level data is simply not precise enough to pick up the effects of the mortality shock very well.

Recall that our leading candidates to explain the bump in life insurance sales in 1919 were the epidemic, War Risk Insurance, and the increase in income. Our results indicate that disease mortality was not a large factor in ordinary insurance sales. Enlistment rates are not correlated with ordinary or industrial insurance holdings, once region is controlled for, suggesting that the promotion of War Risk Insurance cannot explain the increase in sales. This leaves rising income as a leading candidate for explaining the surge in ordinary life sales. Some of this increase in income might be considered an indirect effect of the epidemic, though, as the disease reduced labor supply and contributed to the increase in wages.

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Table 1:
Life Insurance Coverage by Type of Policy, 1917-1919

		Amount of Insurance ($)		Cost of Insurance ($)	
Type of policy(ies)	Median number of policies	Median	Average	Median	Average
Ordinary (*N* = 4175)	1	1000	1354	32.68	41.88
Industrial (*N* = 8336)	3	260	423	23.25	26.76
Fraternal (*N* = 3487)	1	1000	1102	20.00	24.58
Group (*N* = 494)	1	300	559	12.00	15.29
Other (*N* = 221)	1	250	621	12.00	18.33

Source: BLS Cost of Living in the United States, 1917-1919. ICPSR Study #8299

Note: Several respondents reported carrying more than one type of policy.

Table 2:
Proportion of families reporting holding one or more insurance policies,
by survey month, 1918-1919

Proportion Reporting One or More:	Pre-flu (*N*=3130)	Post-flu (*N*=9687)
Life Insurance policies	87.3%	85.6%
Ordinary policies	33.5%	32.3%
Fraternal policies	20.0%	29.5%
Industrial policies	70.7%	63.2%

Source: BLS Cost of Living in the United States, 1917-19. ICPSR Study #8299

Note: Pre-flu includes all families surveyed for the years ending July 31, August 31, and September 30, 1918. Post-flu includes all families surveyed for the years ending October 31, 1918 through February 28, 1919.

Table 3:
Regional Distribution of Families Surveyed, by Survey Month
Cost of Living Surveys, 1918-1919

Region:	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	All Months	Total Pop'n
New England (%)	0.0	20.1	8.1	20.0	30.8	0.0	0.0	0.0	10.4	7.0
Mid Atlantic (%)	0.0	64.9	49.0	16.4	6.4	0.0	0.0	0.0	16.9	21.0
South Atlantic (%)	99.7	0.0	0.0	3.5	12.9	23.1	12.8	34.7	13.3	13.2
East North Central (%)	0.0	14.8	0.0	40.4	22.8	34.4	6.5	0.0	20.9	20.2
West North Central (%)	0.0	0.0	1.6	4.3	14.2	5.6	23.2	38.3	9.9	12.0
East South Central (%)	0.3	0.0	0.0	0.0	0.0	11.7	22.7	0.0	6.7	8.5
West South Central (%)	0.0	0.0	0.0	0.0	0.0	8.3	20.8	11.4	6.2	9.6
Mountain (%)	0.0	0.0	0.0	0.0	12.9	3.1	14.0	15.7	5.3	3.1
Pacific (%)	0.0	0.0	41.2	15.4	0.0	13.8	0.0	0.0	10.5	5.4
Sample size	302	1495	1334	2789	1195	2638	2401	658	12812	

Sources: BLS Cost of Living in the United States, 1917-19, ICPSR Study #8299; U.S. Bureau of the Census, 1996.
Total population distribution is extrapolated for 1918 from 1910 and 1920 Census.

Table 4:
Number of Cities and Households in Cost of Living Survey, by Region,
in the Death Registration Area in 1917

Number of Cities in Cost of Living Survey, by Region and Mortality Rate Availability

	Have City Mortality	Have State Mortality	Have Neither Mortality	Total
Northeast	11	10	0	21
Midwest	12	12	8	32
South	9	5	14	28
West	6	10	2	18
Total	38	37	24	99

Number of Households in Cost of Living Survey, by Region and Mortality Rate Availability

	Have City Mortality	Have State Mortality	Have Neither Mortality	Total
Northeast	2638	858	0	3496
Midwest	2362	1042	547	3951
South	1577	380	1395	3352
West	957	906	155	2018
Total	7534	3186	2097	12817

Source: BLS Cost of Living in the United States, 1917-19, ICPSR Study #8299; U.S. Bureau of the Census. *Mortality Statistics, 1920.* Twenty-first Annual Report. Washington, D.C.: GPO, 1922,

Table 5:
Variables and Predicted Effects on Probability of Owning One or More Policies, by Type of Insurance

Variable	Predicted effect of variable on the probability of owning one or more policies		
	Ordinary	Fraternal	Industrial
Husband's age	+	+	+
Husband's age squared	-	-	-
Husband's earnings	+	+	-
Wife's earnings	-	-	+
Children's earnings	-	-	+
Savings	+	+	-
Home ownership	+	+	-
Number of young children	+	+	+
Number of older children	-	-	+

Table 6: Ordinary Least Squares Coefficients and Clustered Standard Errors On Spending on Industrial Life Insurance, 1918-19

Panel A: Variable	(1) Mean	(2) Difference-in Differences	(3) Add Household and Regional Controls
Post-flu * Severe	0.083	12.122**	6.180*
		(5.396)	(3.121)
Post-flu	0.633	-6.257**	-4.163**
		(2.452)	(2.003)
Severe	0.172	-10.087***	-4.080**
		(3.356)	(1.552)
R^2		0.022	0.162
N		8475	8475

Panel B: Variable	(1) Mean	(2) Difference-in Differences	(3) Add Household and Regional Controls
Post-flu * Mort rate	12.079	0.691	0.722*
		(0.546)	(0.369)
Post-flu	0.649	-14.573†	-16.756**
		(11.007)	(7.352)
Mortality rate	19.378	1.053**	0.553††
		(0.521)	(0.373)
R^2		0.071	0.177
N		8868	8868

Source: BLS Cost of Living in the United States, 1917-1919. ICPSR Study #8299

Note: ***99% significance level
**95% significance level
*90% significance level
††85% significance level
†80% significance level

Table 7: Ordinary Least Squares Coefficients and Clustered Standard Errors
On Holding One or More Insurance Policy, 1918-19

	Industrial Policies		Ordinary Policies		Fraternal Policies	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Difference-in-Differences	Add Household and Regional Controls	Difference-in-Differences	Add Household and Regional Controls	Difference-in-Differences	Add Household and Regional Controls
Post-flu * Severe	0.191††	0.079†	-0.102*	-0.112*	-0.163***	-0.161***
	(0.117)	(0.057)	(0.059)	(0.061)	(0.037)	(0.040)
Post-flu	-0.072††	-0.041†	0.011	0.029	0.095***	0.081***
	(0.044)	(0.030)	(0.035)	(0.030)	(0.029)	(0.025)
Severe	-0.196**	-0.071*	0.022	-0.030	0.093***	0.074**
	(0.080)	(0.038)	(0.040)	(0.038)	(0.026)	(0.028)
R^2	0.012	0.077	0.002	0.082	0.010	0.055
N	8475	8475	8475	8475	8475	8475

Source: BLS Cost of Living in the United States, 1917-1919. ICPSR Study #8299

Note: ***99% significance level ††85% significance level
**95% significance level †80% significance level
*90% significance level

Table 8: Ordinary Least Squares Coefficients and Clustered Standard Errors
On Industrial Insurance Spending, 1918-19

	Pre-flu		Post-flu	
	(1)	(2)	(3)	(4)
Variable	Mean	Coeff (St. Err)	Mean	Coeff (St. Err)
Mortality Rate	15.41	-0.257	18.60	1.760***
		(0.445)		(0.188)
Husband's age	37.19	0.328*	37.01	0.335*
		(0.163)		(0.195)
Husband's age sq	1456.34	-0.003	1443.71	-0.002
		(0.002)		(0.001)
Husband's earnings	1307.92	0.002	1327.68	-0.000
		(0.002)		(0.001)
Wife's earnings	17.86	0.010*	16.33	0.010**
		(0.006)		(0.005)
Child earnings	105.87	0.007†	91.03	0.008***
		(0.005)		(0.002)
Own home	0.204	-3.335***	0.268	-3.082***
		(1.031)		(0.731)
Savings	64.48	-0.023**	77.43	-0.002†
		(0.009)		(0.001)
Children Age 0-4	0.890	0.521	0.890	1.804***
		(0.524)		(0.325)
Children Age 5-9	0.771	3.050***	0.786	2.153***
		(0.519)		(0.307)
Children Age 10-14	0.543	2.308***	0.568	2.989***
		(0.681)		(0.452)
Children Age 15+	0.327	4.084**	0.313	1.850**
		(1.516)		(0.719)
Regional Dummies		Yes		Yes
R^2		0.217		0.182
N		3109		5759

Source: BLS Cost of Living in the United States, 1917-1919. ICPSR Study #8299

Table 9: Ordinary Least Squares Coefficients and Clustered Standard Errors
On Holding One or More Insurance Policy, 1918-19

	Industrial Policies		Ordinary Policies		Fraternal Policies	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Pre-flu	Post-flu	Pre-flu	Post-flu	Pre-flu	Post-flu
Mortality Rate	-0.004	0.028***	-0.005	-0.007	0.005	-0.008*
	(0.008)	(0.004)	(0.006)	(0.006)	(0.012)	(0.005)
Fraternal policy			-0.136***	-0.156***		
			(0.023)	(0.015)		
Ordinary policy					-0.103***	-0.143***
					(0.020)	(0.016)
Household Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.122	0.075	0.096	0.080	0.041	0.061
N	3109	5366	3109	5759	3109	5759

Source: BLS Cost of Living in the United States, 1917-1919. ICPSR Study #8299

Table 10: Ordinary Least Squares Coefficients and Clustered Standard Errors
On Log of Real Insurance Written, by State, 1916-1923

Variable	Means	Ordinary Written		Industrial Written	
Mortality Rate	13.41	-0.019	0.014	0.115***	0.100**
		(0.015)	(0.019)	(0.027)	(0.044)
Log Population	14.43	1.024***	1.011***	1.091***	1.079***
		(0.029)	(0.038)	(0.069)	(0.131)
Urbanization Rate	0.509	0.023	0.407*	3.907***	3.779**
		(0.243)	(0.241)	(1.001)	(1.431)
Log Real Inc/Cap	8.29	0.716***	0.490**	-1.589**	-1.444
		(0.160)	(0.208)	(0.677)	(1.255)
Enlistment Rate	0.040	4.736**	3.161	-22.800†	-20.768
		(2.144)	(2.470)	(17.401)	(18.651)
Fixed year effects		Yes	Yes	Yes	Yes
Regional Dummies		No	Yes	No	Yes
R^2		0.968	0.976	0.891	0.892
N		257	257	256	256

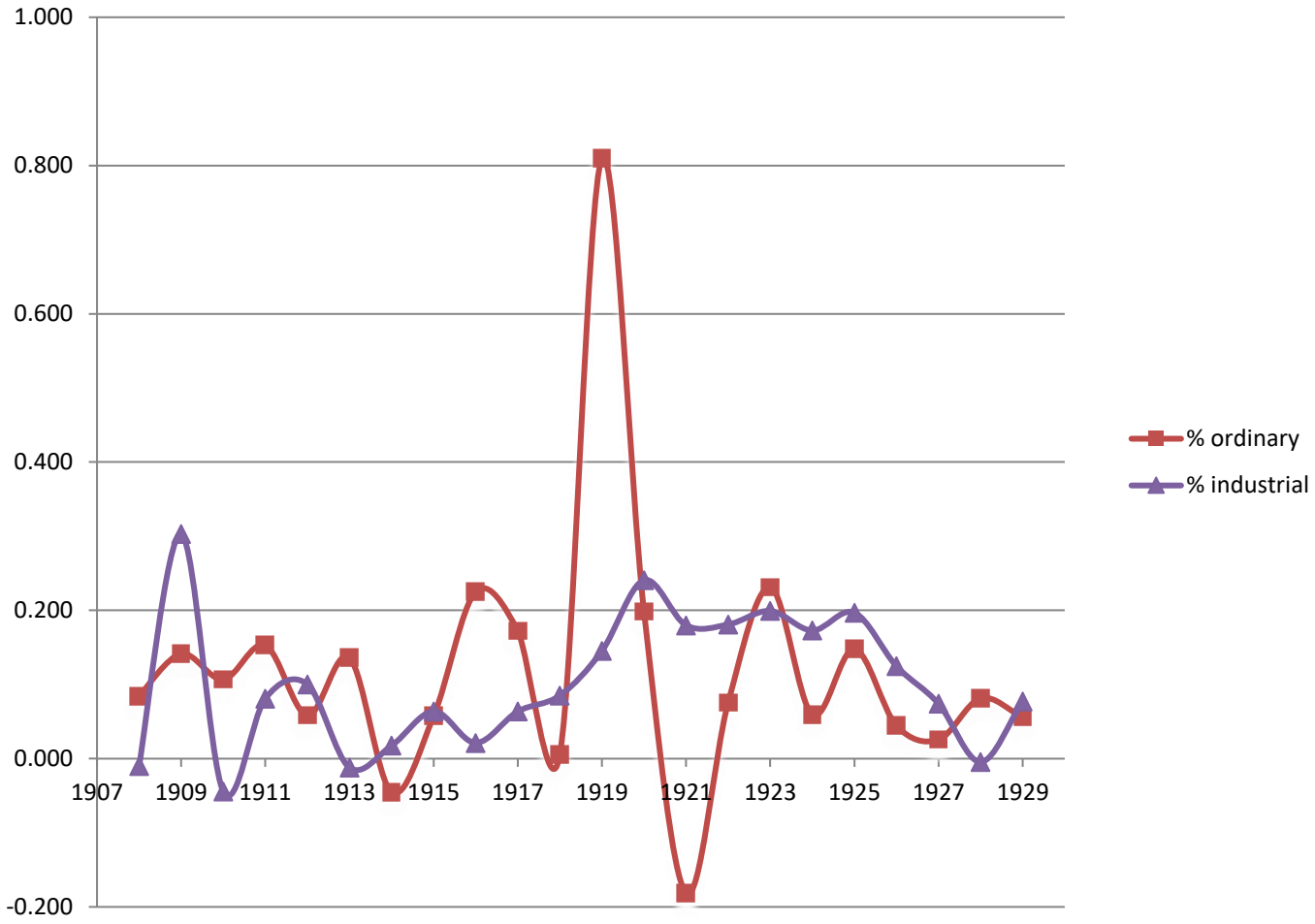
Source: Spectator Insurance Yearbooks, 1916-1923. Life Insurance by States tables.

Table 11: Ordinary Least Squares Coefficients and Clustered Standard Errors
On Change in Log of Real Insurance Written, by State, 1916-1923

Variable	ΔLog Real Ordinary Written	ΔLog Real Industrial Written
ΔMort Rate	-0.025*	-0.000
	(0.014)	(0.018)
ΔMortRate x 1918	0.026***	-0.022†
	(0.009)	(0.013)
ΔMortRate x 1919	0.002	-0.025††
	(0.022)	(0.018)
ΔMortRate x 1920	0.000	-0.033†
	(0.031)	(0.020)
ΔMortRate x 1921	0.035	-0.035††
	(0.031)	(0.025)
ΔMortRate x 1922	0.031	-0.049**
	(0.027)	(0.023)
ΔMortRate x 1923	0.038†	-0.038††
	(0.025)	(0.027)
ΔLog Population	0.858	-0.146
	(0.902)	(1.138)
ΔUrban Rate	4.047†	-3.526
	(2.699)	(3.483)
1918	-0.526***	0.506***
	(0.130)	(0.185)
1919	0.671***	0.064
	(0.226)	(0.175)
1920	0.106	0.257†
	(0.317)	(0.168)
1921	-0.512**	0.422*
	(0.246)	(.243)
1922	0.131	0.503***
	(0.207)	(0.135)
1923	0.110	0.083
	(0.092)	(0.224)
R sq	0.544	0.456
N	218	217

Source: Spectator Insurance Yearbooks, 1916-1923. Life Insurance by States tables.
Note: ***99% significance level ††85% significance level
**95% significance level †80% significance level
*90% significance level

Figure 1: Percentage change, over previous year, in face value of life insurance sold 1907-1929



Source: Eugene N. White, Table Cj723-726. Life insurance--sales, by type of insurance: 1854-1998.
Notes: "Beginning in 1919, figures exclude revivals, increases, and dividend additions.
Figures for industrial life insurance exclude revivals, increases and dividend additions starting in 1893."