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Journal of Cooperatives

Volume 29 *2014* *Page 1-26*

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Abstract:

The objective of this research is an analysis of the firm-level factors that led to relatively longer survival for individual firms in the township mutual industry in Minnesota. Next, the trends in the data provide support for the claim that the shrinking number of farms in their market areas negatively impacts long-term survival. This consideration is even more significant to organizations that, as a result of their legal and historical legacies, have remained smaller than their commercial competitors. Moreover, the variable that was most significant in these analyses was surplus, or profitability. While it is helpful to know that profitability is heavily correlated with long-term survival, this finding does not provide a basis on which a practitioner can realize this result.

Introduction

Township mutuals were organized in the latter half of the 19th century to provide fire insurance to their mostly small, rural farmer member. The mutuals were responding to a gap in the offerings of the larger stock and mutual corporations. Stock corporations had neither the ability nor the incentive to provide low-cost fire insurance to farmers spread over a large geographic area, which led these communities of farmers to provide this insurance on their own. In this sense, township mutuals represent a form of cooperative. The objective of this research is an analysis of the firm-level factors that led to the outcome of comparatively longer survival of individual firms in the township mutual industry in Minnesota. In other words, what characteristics of individual firms can be correlated with longer duration.

Background on the Township Mutual Fire Insurance Model

While the business question with fire insurance is how individuals can protect themselves against loss from fire, the personal impact of loss from fire is, at least potentially, fundamental to their economic well-being. Fire has the ability to complete wipe out a person's economic assets and ruin them financially especially when there were no electric lights and kerosene lamps were widely used in homes and farm buildings. It is no surprise, therefore, that one of the first

forms of insurance was to protect people from loss resulting from fire. The principle of spreading the risk of loss from fire over a larger group of people in the United States can be traced as far back as 1735, with earlier forms of the basic business model seen in England as much as a century before this (Valgren 1924).

Furthermore, many of these early insurance providers had a cooperative or mutual form of organization because many of the communities that founded them recognized that an individual's loss from fire would have repercussions for the larger community, both in the form of missing levels of production and also the possibility of economic destitution on the part of its victims. Insurance providers organized as stock companies evolved near the end of the 18th century, and these companies experienced high levels of growth in the first part of the 19th century with a subsequent high exit rate as the industry matured. The resulting industry structure contained more commercial than mutual insurance, and high levels of fraud and economic mismanagement were observed in this timeframe (Valgren 1924, p.5).

With fire insurance, individual consumers have specific needs and, within a group, similar risk profiles. As a result, a group of fire insurance companies called "class mutuals" evolved to address the specific needs of specific groups of consumers. These organizations limited themselves to that specific group, such as a creamery and cheese factory mutual. This form of organization led to two benefits. First, they developed expertise in the specific types of risk, the nature and validity of claims, and risk-prevention techniques. Second, they experienced a higher level of group cohesion than, for example, everyone who lives in a given city or town. This second benefit is of particular note given the mutual form of organization for these companies. Over time, farmers began to recognize that many commercial offerings were expensive, and, if they worked together, they could mutually insure each other's risks. Using this model of a class mutual, they formed insurance organizations to achieve these objectives.

These township mutual companies were small, local companies that, initially, operated on an assessment plan basis, the primary feature of which, from the farmers' perspective, was its ability to keep the costs of insurance low. The model is simple: when a given loss situation occurs (i.e., a fire in the case of township mutuals), members were assessed a pro-rata portion of the benefits paid to the beneficiaries. While members were also charged some portion of the administrative and other costs associated with the operation of the business, the main cost of providing this insurance was in the pro-rata assessments.

The primary benefit of this type of insurance scheme is that it keeps costs low. Unless losses are unusually high, this form of simple organization is cheaper

than commercial insurance because, at the very least, there is no profit distributed to the shareholders of the stock insurance organization. The primary weakness of this form of insurance is that it does not scale well. Administratively and economically, as the number of members increases, the administrative burden of assessments and the inability for the organization to have sufficient liquidity make the model difficult to use. The strain that assessment systems placed on administrators resulted in their replacement with an early form of premium system, described in detail by Keillor (2000). As a result, these organizations moved from the assessment system to a premium model, although the interest in keeping premiums low survived this transition.

A question of interest with the assessment model of providing insurance is the ability to enforce a given assessment. In other words, at first glance, the assessment system would appear to be highly vulnerable to the free rider problem. When an assessment is made, how quickly and easily could it be collected? On the one hand, in the case of township mutuals in Minnesota, the Insurance Commissioner cited this as one of the reasons for his opposition to township mutuals. On the other hand, from the perspective of the collective action and social capital literature, small groups of homogenous actors should be able to enforce these types of obligations on their members at a level not considered in standard neoclassical economic theory. The evidence, as seen in Keillor (2000, p. 91), suggests that the amount of unpaid assessments was low.

The collective action literature provides a basis for this outcome. Hardin (1982) discusses a model of human behavior he calls “contractarian”. In this approach, actors will “play fair, [and] try to cooperate if others do”. This model is frequently adapted by low-endowment actors, the relevant populations for township mutuals. In this example, the possibility of peer sanctions promotes fair play on the part of all actors. Another manifestation of this particular form of collective action behavior is the need for members to validate the outcomes of the organization. To provide a specific example, if a member of a township mutual files a claim of questionable validity for a barn that has burned down and the claim is then denied, in order for the organization to survive over the long term, a majority of the members must affirm the decision to deny the claim or the organization will lose credibility.

Clough (1946) notes that, despite its weaknesses, township mutuals used the assessment model in the early stages of their development, even though it had been tried and rejected in a number of other contexts. The early fraud and mismanagement in the larger insurance industry can help to explain this apparent irrationality. The assessment system can be seen as a response to these excesses, as the justification for the assessments is clearly documented, the costs of the

assessments is directly related to the documented losses, and the focus of the owners and managers is on lowering payments by members. Without a pooling of risk and the addition of administrative and management expenses and profits for shareholders, the cost of the assessment is lower. The transparency and simplicity of this system appealed to the early policyholders for these products.

While the insular nature of these communities promoted a response to the general lack of commercial insurance that was highly tailored to their individual needs, township mutuals found that working outside a traditional market structure was not without its challenges. Specifically, these organizations had to confront (1) a perpetual lack of working capital, (2) the difficulties of a democratic or consensus management structure, and (3) competition against organizations with greater levels of resources at their disposal. That said, they were able to develop a niche in which they were able to survive and prosper.

Relevant Literature

The principal sources for analysis and history of the township mutual industry are Valgren (1911), Valgren (1924) and Keillor (2000).[a] Valgren (1924, p.15) states that the first "mutual fire insurance companies organized by farmers for the insurance of their property came into existence shortly after 1820" with the first law governing their operations enacted by the New York State Legislature in 1857. Despite the early repeal of this law, a subsequent law in New York and similar laws in different states were on the books by the mid-1870s. Moreover, by the time of his latter writing, Valgren (1924) observes that "suitable" township mutual fire insurance laws had been enacted in twenty-five states with a relatively high concentration of these firms in the Northeast and Midwest.

One characteristic of these early companies was their lukewarm reception by the insurance regulators in their states. These regulators were apprehensive about the unique organizational aspects of township mutuals, but, ultimately, positive experience with these companies promoted their acceptance. Another characteristic of these companies was the contrast between the experience in the Northeast and Midwest, as compared to that of the South. Valgren (1924) contends that the relative failure of township mutuals in the South can be traced to the fact that they were organized on a state, instead of a local, level and as a result, they were not able to either take advantage of either the local solidarity seen in many of these organizations or generate the loyalty to the statewide organization necessary to ensure their success.

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[a] This last study only covers the period 1859-1939.

In Minnesota, the question of providing mutual fire insurance has an interesting past. Keillor (2000) characterizes the tensions in authorizing township mutuals as the tension between, on the one hand, the state's "Old Stock" leadership, by which he meant people whose families had immigrated to the United States a few generations before the period of the 1860s and, on the other hand, the more recent, ethnic immigrants. Starting as early as the 1860s, farmers began to provide an assessment-based form of fire insurance as a natural evolution of the mutual aid they had provided to each other before this time. (Keillor 2000) The first known organization created for this purpose was in the township of Vasa in Goodhue County, Minnesota in February 1867. Although this organization was initially unincorporated, it existed independently into the late 20th century. Similar groups were organized in Washington County (March 1867), Nicollet County (March 1869) and Goodhue County (February 1869).

As the new industry evolved, three features immediately became evident. First, the need to become both more professional and more focused became evident as the burdens of the assessment system and large growth, relative to the structure of the company, manifested themselves. In addition to replacing the assessment system with an early version of a premium system, management became more professional as these organizations were now responsible for multiple millions of dollars of insurance. Second, citing the example of Scandinavian Fire Insurance Company, Keillor (2000, p.82) asserts that the failure of this organization can be traced to having too many simultaneous objectives, including promoting the political interests of their members, providing mutual aid as insurance, ensuring ethnic unity, and promoting religious conduct. In other words, under the weight of all of these objectives, the organization failed. This feature speaks to the multiple objectives these organizations had within their communities. Finally, Valgren (1924, p.20) observes that as early as 1900, more growth in the industry was the result of existing companies growing rather than new entrants, highlighting the quick establishment of the firms and the degree to which they responded to the needs of their members..

Attributes of Township Mutual Fire Insurance Companies

The attributes of township mutual fire insurance companies start most appropriately with a discussion of fire loss itself. First, fire losses are largely separable, meaning that the risk to each policyholder is unique to them and their property. As a practical matter, fires on farms did not spread to other farms, a fact that greatly reduces the geographic area and number of policyholders that are necessary to sufficiently spread the risk among a group of farmers. The second consideration concerning fire losses is that they are largely preventable (Valgren 1924). For organizations that have lowering the cost of insurance as their primary

imperative, the fact that many of the losses are avoidable becomes a highly relevant and important fact, which will be discussed below.

Second, turning to the policies themselves, Valgren (1924) defines the relevant elements of the policies as the types of risks that are covered, the property insured, and the business territory. In examining the definition of covered risks, in addition to the basic risk of fire, fires started by lightning were also a feature of the early township mutual policies, and this attribute persisted. However, as Valgren points out, states and firms that included damage from windstorms in their policies encountered greater business risk because (1) windstorms would greatly increase the variance of the incurred losses in a given year, and (2) windstorm damage is not generally as separable in the same way fire damage. Although in Minnesota different organizations specifically address the risk from windstorms, this question shaped the early township mutuals across the country.

Looking at property insured, the original intent of these policies was to cover only farm buildings and equipment. However, two considerations make the application of this standard less clear, and they both concern the question of whether crops were covered in these policies. First, in determining the asset value to cover, 1/5 of all crops were assumed to be in storage on the farm, and they were included in the policy (Valgren 1924). Second, given the community nature of the firms, they had a broad level of discretion in assessing fire damage, and, if other members agreed, they could accommodate a broad range of mitigating circumstances. As a result, it was not always clear whether crops or other assets were included in the property insured by these firms. That stated, the original stated intent was to cover only farm buildings and equipment.

Next is the question of the territory covered. The use of the term "township" in their name reflects the original intent that these organizations be small and local in nature, limited to the "ethnic groups in a few contiguous townships [who] would form one mutual" (Keillor 2000, p. 89). In fact, the 1875 law authorizing township mutuals in Minnesota limited their operations both only to certain counties and also only to one township per firm. These requirements were loosened before 1890, which served to expand the insurable area and provide even greater assurances that these firms could satisfy their obligations. Related to this question of territory is the effect of economies of scale. Valgren (1924) analyzed 1,566 companies between 1915 and 1917, creating groups of firms according to the number of townships or counties they served and then comparing their expense ratio, which he used as a proxy for efficiency. His main finding was that efficiency increases over a certain range of firm size, only to then decrease beyond a certain point. The thresholds in his analysis were that

efficiency increases as firm size increases to a coverage area of 6 to 10 townships but decreases as firms grow larger. Moreover, in his Appendix 4, Valgren shows that losses as a percent of total expenditures do not decrease significantly until a firm covers 4-5 counties, and, interestingly, expenses as a percent of total expenditures also increase after the same 6 to 10 township grouping.

Third, the attention these firms paid to keeping costs low is noteworthy in terms of its singular nature. The specific means by which the relatively low capital needs lower the cost of insurance are, first, to assess members directly for losses and not keep a significant amount of capital on hand, and, second, by not including the costs of administering a large company or paying dividends to shareholders. A more subtle effect on costs of the assessment system is that, particularly in small rural communities, policyholders can scrutinize assessments and withhold payment if they judge them to be excessive. Third, by excluding windstorm loss, the founders of early township mutuals limited the exposure and risks they faced. Keillor (p.94) provides an example of a township mutual further limiting its exposure and achieving a lower loss expense per hundred dollars of insurance by only insuring up to 2/3 of the value of the damaged goods and not initially covering losses from sparks from trains. While each company's policies were different, this method of defining the reimbursable risks helped to lower costs.

Fourth, by using inspectors, these companies could (1) help to educate members as to how to lower the risk of a fire, (2) evaluate claims more effectively, and (3) classify risks and behaviors according to their level of riskiness. Valgren (1924, p.80) makes the claim that these inspectors paid for themselves many times over by performing these tasks. Keillor (2000, p. 95) adds that the majority of policyholders in the early township mutuals actually favored close inspection, because they were committed to keeping costs low. He notes that because inspections were performed by neighbors, members of a community could develop a reputation, which would have a bearing on any claims they would make. One mitigating factor in this system, which could easily be put to negative use, was the fact that, if a disagreement was serious enough, policyholders still had recourse in the courts.

Fifth, these companies were organized around the principle of forward integration, where producers either perform certain functions themselves or otherwise eliminate middlemen. This fact mainly impacts administrative costs. Since a number of these organizations did not employ professional agents and acquired new members through word of mouth, the costs of a salesforce could be avoided. Furthermore, the low capital requirements meant that the cost of

expansion would be relatively low. Also, the relatively small geographic area meant that other information and administrative costs were lower.

Approach and Methods

Risch, Boland, and Crespi (2014) conducted an exhaustive literature review on empirical studies of entry and exit and survivorship in the industrial organization literature.[b] This methodology has its foundations in the evaluation of medical treatments: how long can a given patient, defined by a set of covariates, expect to survive in the presence of a given treatment? The concept is easily extended to a number of engineering and economics applications.

Survival analysis, in the industrial organization literature, analyzes both the time to failure, which is defined as the time until the subject exits the industry, which is not repeatable, and also the probability of failure. The analysis takes specific form in the survivor function, *S(t)*, and a hazard function, *h(t)*. More formally, if *T* represents the time to failure, and *t* represents a given point in time, then the survivor function is based on the cumulative distribution function of *T*, *F(t)*, which represents the length of time a subject "lives", and its corresponding probability distribution function, *f(t)*. These terms can be combined in the following equation:

$$S(t) \equiv 1 - F(t) = \Pr(T > t).$$

Equation 1: The Survivor Function

The survivor function represents the probability, at any given point *t*, that the time to failure is longer than the elapsed time. *S(t)* can thus be interpreted as the probability of surviving past time *t*; by contrast, the hazard function, *h(t)*, is the probability that a given subject will "die" per unit of time. The hazard function is also called the "instantaneous rate of failure or death", and it can be represented as the following limit, which also highlights the relationship between *h(t)* and *S(t)*:

$$h(t) = \lim_{\Delta t \to 0} \frac{\Pr(t+\Delta t > T > t \mid T > t)}{\Delta t} = \frac{f(t)}{S(t)}.$$

Equation 2: The Hazard Function

[b] This study uses the term "survival analysis" to describe this method, although "duration analysis" is interchangeable.

With this foundation, the cumulative hazard function, *H(t)*, can be seen to be the total risk of failure up to time *t*, as

$$H(t) = \int_0^t \frac{f(u)}{S(u)} du = -\ln\{S(t)\}\,.$$

Equation 3: The Cumulative Hazard Function

The hazard function measures the number of failures per year. If the hazard function is constant at two failures per year, then the probability of witnessing at least one failure in a given year would be $1 - \exp(-2) = 0.865$, or 87%. As the hazard function changes, so does the probability of observing a failure. Conversely, if the hazard function remains constant, its reciprocal is the amount of time until a failure occurs. This perspective also enables the interpretation of the cumulative hazard function as the total number of failures over a given interval.

Conceptual Model

This study uses the Cox (1972) proportional-hazard model approach, the main benefit of which is avoiding the need to estimate a baseline hazard function. This task is accomplished by making the assumption that the hazard rates across the firms are proportional and can be represented as a proportion:

$$\frac{h_i(t)}{h_j(t)} = \exp\left[\sum_k \beta_k (x_{ik} - x_{jk})\right]$$

Equation 4: Township Mutual Conceptual Model

In this equation, $h_i(t)$ represents the hazard rate of a given firm, with subscripts *i* and *j* denoting different firms. β_k represents the variables that do not change over time, and x_{ik} and x_{jk}represent the values of the covariates for a given firm. [c] This model also has the feature of not having an intercept because the baseline hazard function is not estimated.

This study also utilizes the Kaplan-Meier (1958) estimate of the survivor function which represents a non-parametric estimate of the survivor function, *S(t)*, which is the probability of survival past time *t*. The benefit of this analysis is that it provides a readily accessible visualization of the survivor function, which can

[c] This study does not use time-varying variables.

then be used to check the model specification. The specific covariates for this analysis are discussed below.

Model Covariates

In determining the variables to include in this analysis, the shape, nature and evolution of the industry play a more direct role. Specifically, the early legal prohibition and later self-imposed limits on size provide a basis for examining the collective action nature of these organizations. Second, the relative lack of competition from commercial insurance in the rural property insurance market until the late 20th century provides another basis on which to examine the business model. The question of survivorship in township mutuals is better addressed by examining the business drivers that determine the success or failure of a firm. Finally, the changes in the competitive environment, specifically the reduced number of farms and hence potential clients, are also included. The timeframe of this analysis is 1974 to the current date. The reason for using this time period is that township mutuals survived relatively intact as a mature industry until the early 1980s when the Farm Financial Crisis reduced the number of farms and potential customers of these organizations.

The model examines the impact of size, income growth, firm effects, competition, and the impact of the environment on the firm.

- *Size measures the conflicting factors of economies of scale and* collective action considerations. If collective action is more successfully *performed* among smaller groups of people, and economies of scale do not dominate the provision of fire insurance (resulting from the fact that the risk of fire loss is separable), then this variable is a test of the impact of collective action on the firm.

- *Income Growth* measures the impact on survivorship of growth in income, which serves as a proxy for growth.

- *Surplus* proxies for profitability and is a test of firm effects.

- *Competitors* assesses the impact on survivorship on either having a number of competitors in the same market space or not having those competitors. This variable is thus an indirect test of management and firm effects, which given the evolution of these firms is not something that should be taken for granted. A firm with few or no competitors cannot sustain itself, in the absence of strong environmental effects.

- *Farms* measures the impact of the environment on the firms and to what *extent* the reduction in the number of farms impacedt the township mutuals.

The equation for the survival analysis is, with *i* indexing the firm:

$$\frac{h_i(t)}{h_j(t)} = \beta_0 + \beta_1 * Size_i + \beta_2 * Income\ Growth_i + \beta_3 * Surplus_i + \beta_4 * Competitors_i + \beta_5 * Farms_i$$

Equation 5: Township Mutual Estimation Equation

Hypotheses Tests

There are two conflicting theoretical justifications for the impact of size on township mutuals. On the one hand, economies of scale should be positively correlated with survival. However, economies of scale are not as strong in this industry as most other insurance products. On the other, the collective action literature suggests that the size of groups attempting to provide this type of collective good would be inversely proportional to its success (Hardin 1968). As a result, two theoretical bases counter each other to predict which effect will be more closely correlated with survival. With no clear theoretical direction, that the hypothesis is that economies of scale is stronger than the remaining impact of a collective action culture. [d]

<u>Hypothesis 1</u>: $\beta_1 < 1$

Equation 6: Hypothesis 1

Income Growth is naturally positively correlated with financial health, so the expected effect of income growth on survival is positive. Similarly, *Surplus*, a proxy for profitability, is likewise expected to positively correlate with survival:

<u>Hypotheses 2 and 3</u>: $\beta_2 < 1$, $\beta_3 < 1$

Equation 7: Hypotheses 2 and 3

Competitors, the number of direct competitors a firm has, is expected to be negatively correlated with success. However, two considerations make this

[d] Recall that the survival analysis equation is measuring the hazard rate, or the probability that a given firm "dies", and thus the signs are inversely related to the question of survival. Moreover, given the exponential form of the equation, the results are less than 1.

question more interesting in the context of township mutuals. First, in the early days of township mutuals, firms were organized at the township or community level, and they had relatively little competition, except from other township mutuals, which would likely be at an inherent disadvantage because they were not in the same geography. Valgren (1911) notes, almost in passing, that once township mutuals established themselves, commercial insurers did not aggressively compete in this market space. This fact would argue for this coefficient to not be significantly different than zero, or in the context of how we report results, 1. Second, the type of competition that emerged in this timeframe was not direct competition; it came from organizations that had different product profiles and different resources to bring to the market. As a result, if a township mutual had enjoyed a relative monopoly in its market, then they would not be prepared to compete with these entrants. As a result, this study hypothesizes that the number of competitors is positively correlated with survival because these competitors would better prepare the firm to compete with these new entrants:

Hypothesis 4: $\beta_4 < 1$

Equation 8: Hypothesis 4

Finally, the Farm Financial Crisis and other social trends resulted in a generally reduced number of farms and hence potential customers for these firms. As a result, expectations are that the number of farms in the market space of a given township mutual is positively correlated with survival, or a reduction is negatively correlated with survival.

Hypotheses 5: $\beta_5 < 1$for all intervals

Equation 9: Hypothesis 5

Data Discussion

The evolution in the township mutual industry has dramatically changed the competitive landscape for these organizations. Approximately 50 percent of the township mutuals that entered the market in Minnesota in the 19th and early 20th centuries survived to 2013.

The primary source of data was the Minnesota Insurance Commissioner's *Annual Report*, which was prepared as a bound volume between 1870 and 1935. After this time, individual firm data was available more sporadically on an annual basis. Finally, starting in 1971, the Minnesota Department of Insurance again began preparing summary reports at an industry level. A secondary data source is

the U.S. Department of Agriculture's Census of Agriculture, which provides the farm counts on a county-level basis.

Two aspects of the data structure are relevant to this analysis. First, given the time series nature with firms entering and exiting, averages of individual firm performance are calculated using the available data, as per Greene and Segal (2004). Second, the parameters are converted to unitless measures, which has the effect of controlling for direct industry effects. This conversion captures the impact of industry-level events, to the extent that all firms are equally impacted by them. The specific covariates used in this analysis are:

- *Size* is an average of the relative Total Insurance in Force (TIF) over this interval, measured as a proportion of the sample population average

- *Income Growth* is an average of the period to period growth in premiums, measured as a proportion of the sample population average

- *Surplus* is an average of the surplus the firms reported over this interval, measured as a ratio of the sample population average where surplus for an insurance company is defined as assets minus liabilities. Surplus is used to make insurance payments for buildings that are burned and thus, more surplus means a stronger balance sheet to face unexpected events in the future.

- *Competitors* is the number of competitors a firm has from the sample in the county where it is organized

- *Farms* is the growth in number of farms in the county in which a township is organized, measured at the publication of a Census in Agriculture.

Table 1 reports the mean, standard deviation, minimum, and maximum values for each of these covariates. Figures 1 to 3 show the patterns of entry, exit, and duration for township mutual, while Figure 4 shows the number of firms by their surplus levels in 2010, the last data collection period. Appendix A lists the township mutuals in the data and those remaining in 2013.

Results

The results of the survival analysis on township mutuals are presented in Table 2. The Kaplan-Meier function graph is included as Figure 5.

Size is not significant. If Hypothesis 1 tests whether economies of scale or collective action effects are more powerful in explaining the survival of individual firms, this data from this study provides support for the power of collective action effects. This result is particularly interesting given the power of economies of scale in most studies of the insurance industry (see, for example, Yuengert (1993)), and it likely is the result of both the nature of the firms in this industry as well as the separable nature of the risk of fire loss.

Income Growth is correlated with survival in this industry, both in the direction predicted by Hypothesis 2 and at significant levels. Similarly, profitability, reflected in the *Surplus* variable is highly significant, and in the directions predicted by Hypothesis 3. This stands to reason because of how surplus is defined and the reason why state regulatory agencies monitor the level of surplus in an insurance company.

Competitors in a township mutual's home county is not significant in either regression, and the signs associated with it are not consistent with each other. This outcome is likely a reflection of the novel definition of the variable used to measure the impact of competition on township mutuals, and the data suggest this approach to defining competition is not useful. Given the discussion of the conflicting ways in which this variable might impact the results, this question deserves further study. Hence, the data do not support Hypothesis 4.

Farms, measuring the impact of farm growth, as measured in the years between Census of Agriculture publications, shows varying results depending on the interval. The large coefficients and standard errors in both regressions suggest that these results are highly sensitive to the covariates, as they are expressed in the data. Since the units within the data table are consistent across the variables, these results suggest these variables are extremely powerful predictors of survival. The only interval that is significant was 1987-1992, suggesting that the impact of the Farm Financial Crisis of the 1980s also negatively impacted the township mutuals. Even though Hypothesis 5 predicts that the variables would be significant across all intervals, given the pattern in the results, this analysis concludes that these data provide support for Hypothesis 5, and also that the discussion of Hypothesis 5 should be amended to only reflect the changes of significant, time-constrained events rather than general patterns.

Conclusions

The trends in the data provide support for the claim that the shrinking number of farms in their market areas negatively impacts long-term survival. This consideration is even more significant to organizations that, as a result of their

legal and historical legacies, have remained smaller than their commercial competitors. Moreover, the variable that is most significant in these analyses is surplus, or profitability. While it is helpful to know that profitability is heavily correlated with long-term survival, this finding does not provide a basis on which a practitioner can realize this result.

A factor working in favor of the township mutuals is the ambiguity concerning the impact of size on survival. In other words, economies of scale do not drive the fire insurance market in the same way they drive other insurance markets. This result, coupled with the specialized need the products of these firms provide to their customers, may result in their continued success, at least for a while. However, the limits placed on the types of products they can offer, as part of their authorizing legislation, provide another challenge they must face in responding to their competition.

With regard to township mutuals, further study of additional variables is needed. Congruent with the decline in number of farms, which is correlated with fewer rural homes to insure, is a decline in buildings used on farms. It was far more common for farms to be diversified with different buildings to house animals, feed, and other storage. The 1996 Farm Bill accelerated the process of specialization in agriculture, a trend that had already started. Is the fact that farms today have fewer buildings and hence less physical property to insure important? A second variable is the fact that, while the number of buildings and number of farms is declining, the value of rural houses, machine sheds, crop storage facilities, manure slurry tanks, and other farm buildings have increased. Are township mutuals sophisticated enough to accurately measure the risks for each of these different types of structures and be able to handle a loss of a much greater valued structure?

References

Clough, S. B. *A Century of American Life Insurance.* New York: Columbia University Press, 1946.

Cox, D. R. “Regression Models and Life Tables.” J*ournal of the Royal Statistical Society* 34 (1972): 187-220.

Greene, W.H. and Segal, D. “Profitability and Efficiency in the U.S. Life Insurance Industry.” *Journal of Productivity Analysis*, 21:3 (2004): 229-247.

Hardin, G. “The Tragedy of the Commons.” *Science*, December 1968: 1243-1248.

Hardin, R. *Collective Action.* Baltimore: The John Hopkins University Press, 1982.

Kaplan, E.L., and P. Meier. "Nonparametric Estimation from Incomplete Observations." *Journal of the American Statistical Association* 53, no. 282 (1958): 457-481.

Keillor, S. J. *Cooperative Commonwealth*. St. Paul, MN: The Minnesota Historical Society Press, 2000.

Risch, C.C., M.A. Boland, and J. M. Crespi. "Survival of U.S. Sugar Beet Plants from 1897 to 2011." *Agribusiness: an International Journal* 30,2(2014): 1-14.

Valgren, V. N. "Farmers' Mutual Fire Insurance in Minnesota." *Quarterly Journal of Economics* 25, no. 2 (February 1911): 387-396.

Valgren, V. N. *Farmers' Mutual Fire Insurance in the United States.* Chicago: The University of Chicago Press, 1924.

Yuengert, A. M. "The Measurement of Efficiency in Life Insurance: Estimates of a Mixed Normal-Gamma Error Model." *Journal of Banking and Finance* 17 (1993): 483-496.

Table 1: Township Mutual Summary Statistics

	1974			1984		
	Assets	Surplus	Premiums	Assets	Surplus	Premiums
Mean	181,258	172,949	101,064	479,620	341,984	237,372
Median	149,302	144,274	87,808	410,000	306,000	207,000
Std. Deviation	146,604	140,930	69,925	352,712	302,735	144,494
Minimum	9,462	9,462	2,729	28,000	(116,000)	6,000
Maximum	842,323	832,368	329,439	2,352,000	1,857,000	711,000
	1994			2010		
	Assets	Surplus	Premiums	Assets	Surplus	Premiums
Mean	971,145	777,418	397,932	2,618,170	2,182,923	870,151
Median	876,058	702,728	349,116	2,474,380	2,063,305	708,111
Std. Deviation	631,339	572,647	240,470	1,594,674	1,373,969	612,575
Minimum	111,350	12,422	83,135	442,074	307,332	149,108
Maximum	4,863,378	4,280,055	1,461,222	8,599,508	7,949,570	3,545,888

Table 2: Township Mutual Survival Analysis Regression Results

Covariate	Parameter Estimate	Standard Error	Z Statistic	Prob > z
Size: TIF	0.93	0.34	-0.19	0.85
Income Growth	0.12 ***	0.82	-3.10	0.002
Surplus	0.18 ***	0.089	-3.41	0.0001
Competitors	1.02	0.088	0.21	0.84
Farm Growth: 1974-1978	80.43	284.56	1.24	0.215
Farm Growth: 1978-1982	39.75	191.31	0.77	0.44
Farm Growth: 1982-1987	0.011	0.058	-0.86	0.39
Farm Growth: 1987-1992	1,356.73 *	5,574.09	1.76	0.08
Farm Growth: 1992-1997	0.027	0.063	-1.53	0.125

* = Significant at the 10% level, ** = 5% level, *** = 1% level (n=120, X^2 = 0.0001)

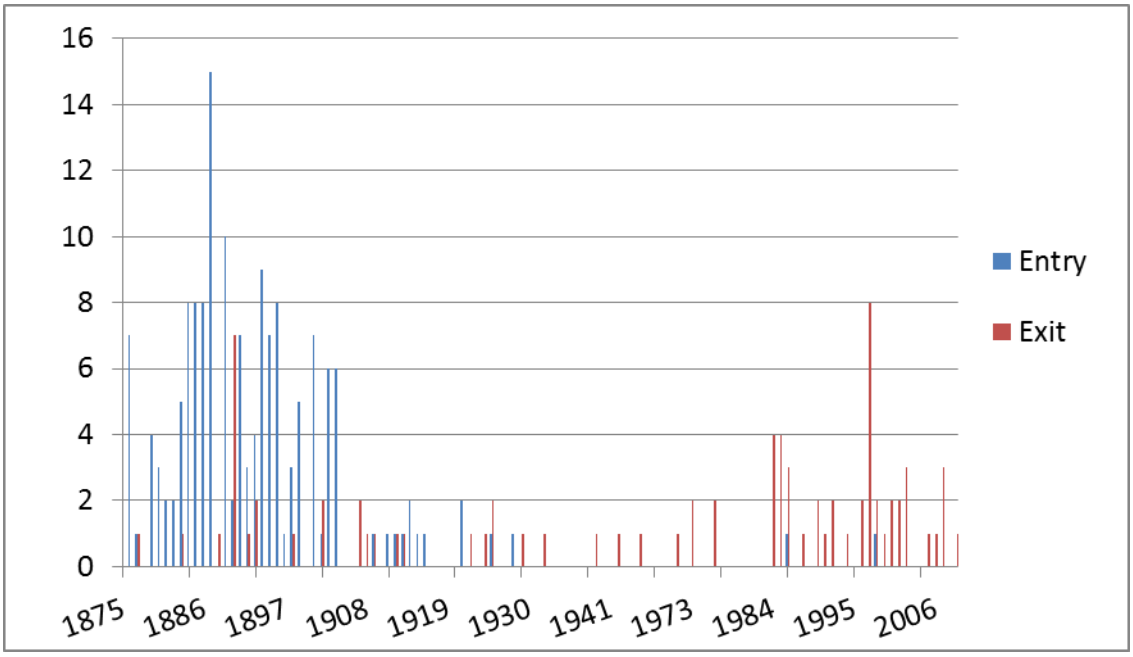

Figure 1: Township Mutual Entry and Exit

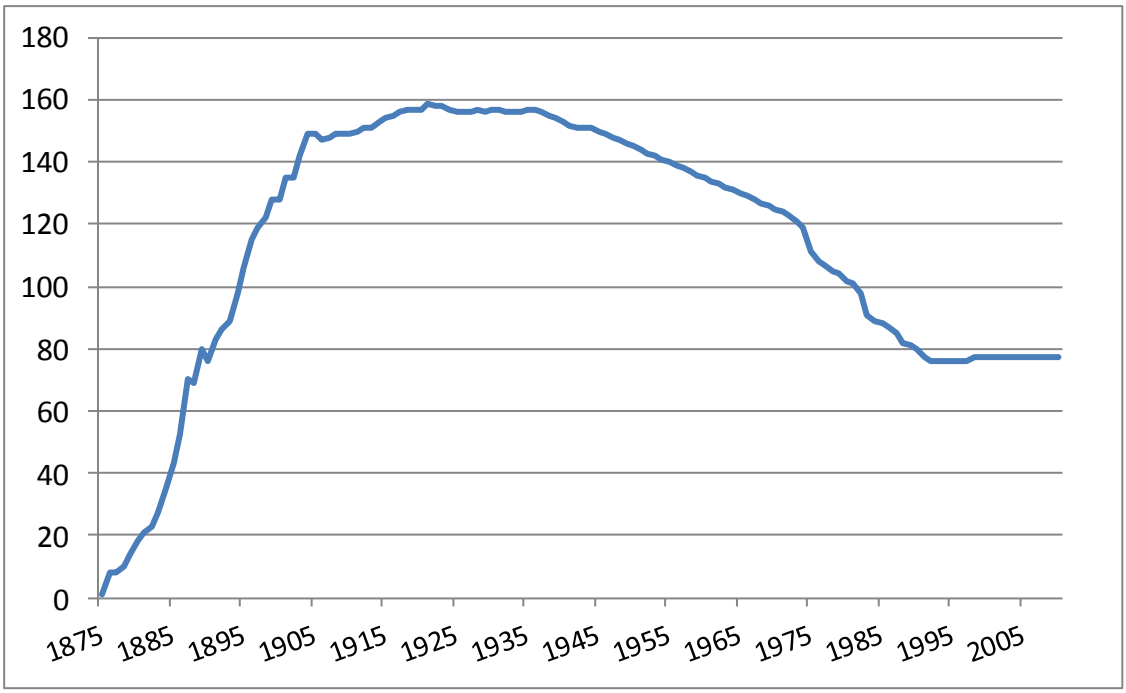

Figure 2: Township Mutual Cumulative Number of Firms, 1875-2013

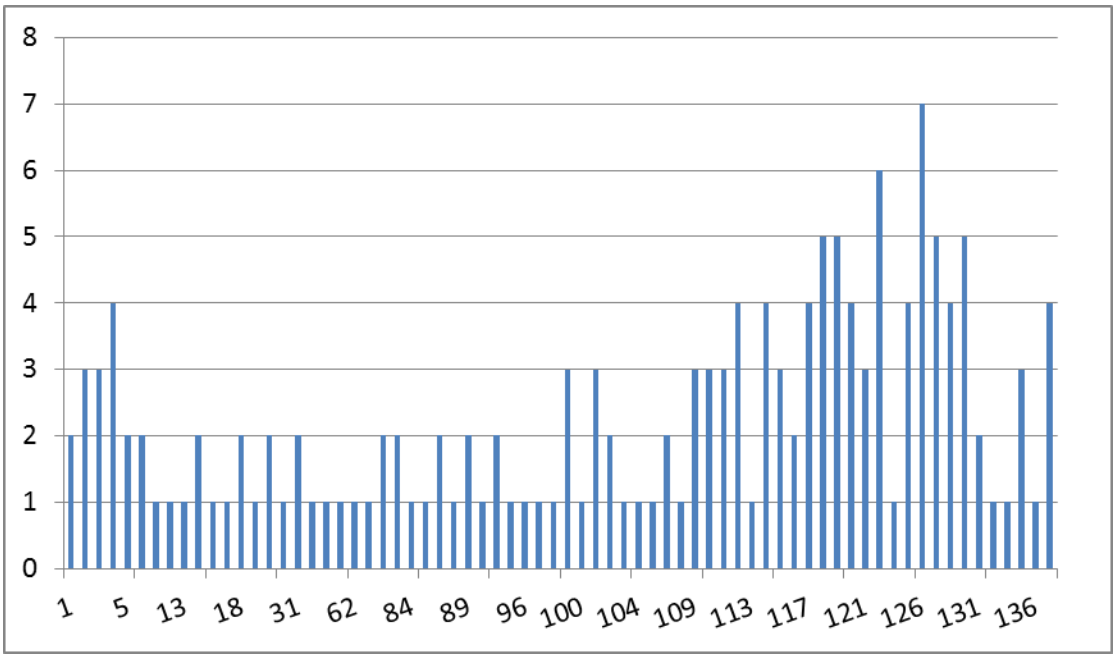

Figure 3: Township Mutual Duration by Number of Firms

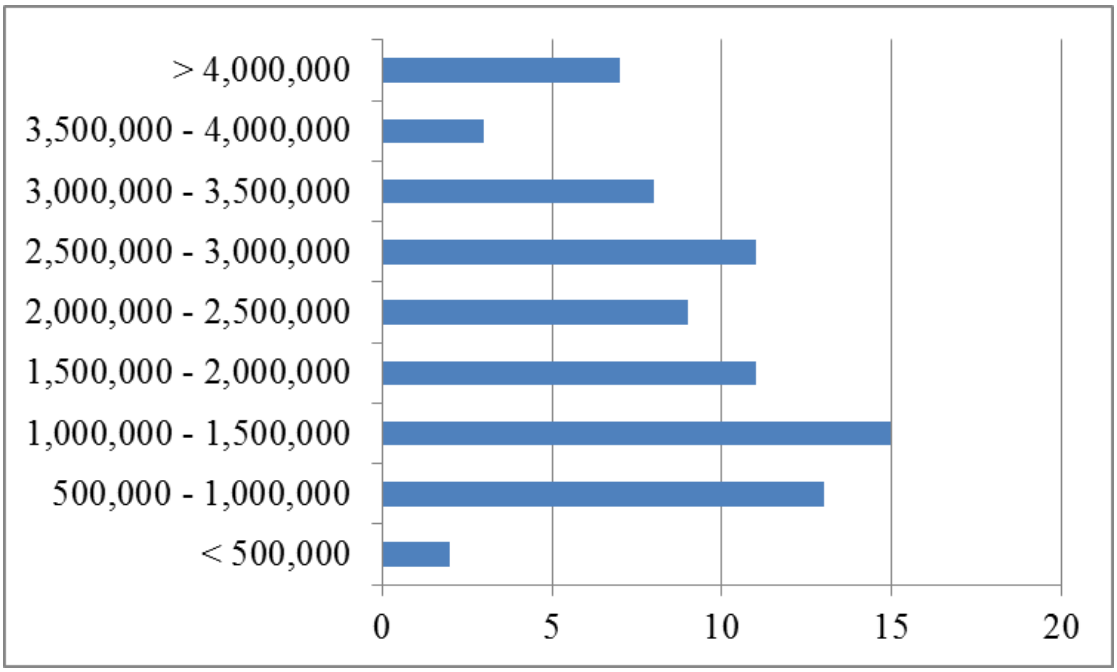

Figure 4: Township Mutuals by Surplus Level (dollars), 2010

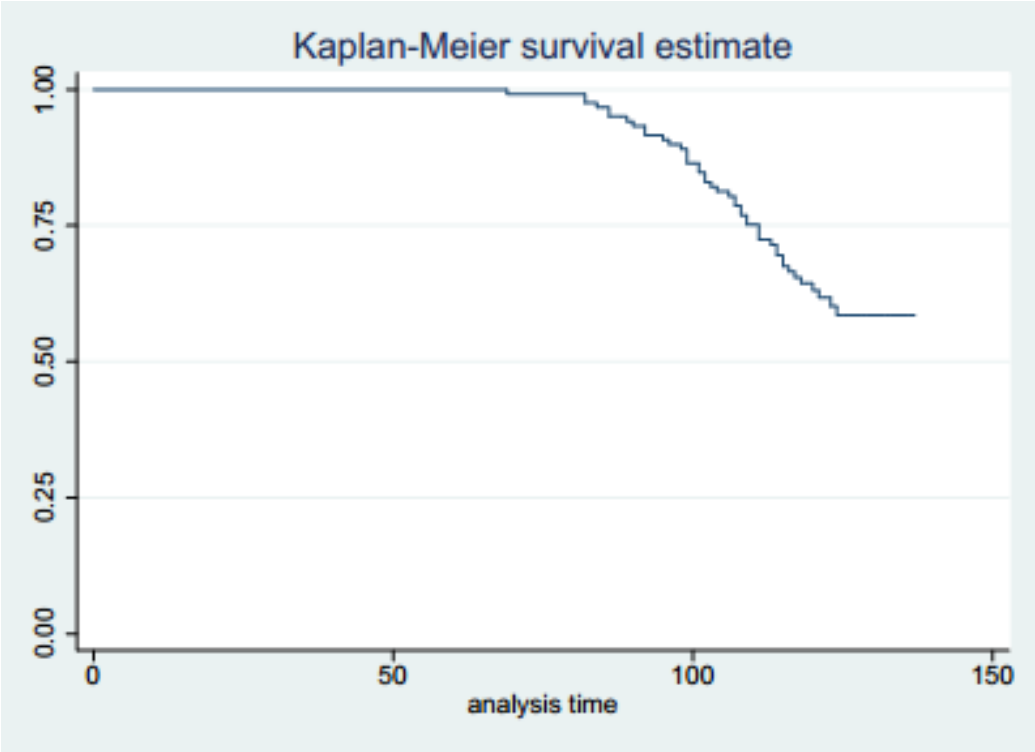

Figure 5: Township Mutual Kaplan-Meier Function

Appendix A: Township Mutual Companies Included[e]

Holden & Warsaw Mutual Fire Insurance Company
Farmers' Mutual Insurance Company, Manchester *
Kenyon, Holden, Warsaw Mutual Fire Insurance Company *
Wanamingo Mutual Fire Insurance Company *
Wheeling Mutual Insurance Company
Wilmington Mutual Insurance Company *
Vernon Edda Mutual Fire Insurance Company *
Hassan Mutual Fire Insurance Company (The) *
Hay Creek Mutual Fire Insurance Company
Norwegian Mutual Fire Insurance Company *
Sumter Mutual Fire Insurance Company *
Acoma & Lynn Mutual Fire Insurance Company
Hawk Creek Mutual Fire Insurance Company
Preble Farmers Mutual Fire Insurance Company *
Arctander & Lake Andrew Mutual Fire Insurance Company(The) *
New Sweden Mutual Fire & Lightning Insurance Company *
Rochester Farmers Mutual Insurance Company *
Acton & Gennessee Mutual Fire Insurance Company
Harmony Farmers Mutual Fire Insurance Company
Pleasant Mound Mutual Fire Insurance Company
Shelby Mutual Fire Insurance Company
Leon Mutual Fire Insurance Company (The) *
Rose Dell Mutual Fire Insurance Company
Stark Farmers Mutual Fire Insurance Company (The) *
Sverdrup Mutual Insurance Company *
Vineland Mutual Insurance Company *
Young America Mutual Fire Insurance Company *
Beaver Creek Mutual Insurance Company *
Delaware Mutual Insurance Company (The) *
Louisville Mutual Fire Insurance Company
Mound Prairie Mutual Insurance Company
Oscar Farmers Mutual Insurance Company (The) *
St. Joseph Mutual Fire Insurance Company *
Vasa-Spring Garden Mutual Insurance Company

[e] = surviving firm in 2013

Hallock Farmers Mutual Fire Insurance Company *
Leenthrop Farmers Mutual Ins. Company (The) *
Palmyra Farmers Mutual Insurance Company *
Parkers Prairie Effington Mutual Insurance Company
Rollingstone Mutual Fire Insurance Company
Spring Vale Mutual Fire Insurance Company *
White Bear Lake Insurance Company *
Agassiz & Odessa Mutual Fire Insurance Company *
Collinwood Mutual Fire Insurance Company (The)
Delafield Farmers Mutual Fire & Lightning Insurance Company
Flom Mutual Fire Insurance Company *
Foster Farmers Mutual Fire Insurance Company
Kelso Farmers Insurance Company *
Lac Qui Parle Mutual Insurance Company *
Madelia-Lake Crystal Mutual Insurance Company *
New Auburn Mutual Fire Insurance Company
North Branch Mutual Fire Insurance Company *
Sweet Township Mutual Fire Insurance Company *
Barber Farmers Mutual Fire Insurance Company
Blue Earth Farmers Mut. Fire Insurance Company *
Fairmont Farmers Mutual Fire Insurance Company
Hope Farmers Mutual Insurance Company *
Plainview Farmers Mutual Fire Insurance Company
Westbrook Mutual Insurance Company *
Bloomfield Township Mutual Fire Insurance Company
Garfield Farmers Mutual Fire Insurance Company *
German Farmers Mutual Fire Insurance Company *
Halstad Mutual Fire Insurance Company *
Kerkhoven & Hayes Mutual Fire Insurance Company *
Lake Park & Cuba Insurance Company *
Minnesota Lake Farmers Mutual Fire Insurance Company
New Prague Mutual Insurance Company *
Bird Island Mutual Fire Insurance Company *
Cokato Mutual Fire Insurance Company *
Laketown Mutual Fire Insurance Company
Bray Mutual Fire Insurance Company *
Flora Mutual Fire Insurance Company *

Gillford Mutual Fire Insurance Company *
Nessel Farmers Mutual Fire Insurance Company
Buffalo Lake Farmers Mutual Fire Insurance Company *
Ceska Mutual Insurance Company
Claremont Farmers Mutual Fire Insurance Company *
Murray County Mutual Insurance Company
Little Rock Mutual Fire Insurance Company
McPherson Farmers Mutual Fire Insurance Company *
Paynesville & Zion Mutual Insurance Company *
Albany Mutual Fire Insurance Company *
Moe & Urness Mutual Fire Insurance Company *
Redwood County Farmers Mutual Insurance Company *
Wakefield Farmers Mutual Fire Insurance Company
Wilmont Mutual Fire Insurance Company *
Comstock & Holy Cross Farmers Mutual Fire Insurance Company *
Crate Farmers Mutual Fire Insurance Company *
Eureka Farmers Mut. Fire Insurance Company
Gordon Mutual Insurance Company
Graham Mutual Insurance Company *
San Francisco Mutual Insurance Company
Shible Mutual Fire Insurance Company *
Stanton Farmers Mutual Fire Insurance Company
King Town Farmers Mutual Fire Insurance Company *
Tara Mutual Fire Insurance Company *
Elmdale Farmers Mutual Insurance Company *
Gentilly Farmers Mutual Fire Insurance Company
Glendorado Farmers Mutual Fire Insurance Company
Marshall County Mutual Insurance Company *
Holmes City Farmers' Mutual Insurance Company *
Melrose Mutual Farmers Fire Insurance Company *
Mower County Farmers Mutual Insurance Company
Pierz Farmers Mutual Fire Insurance Company *
St. Leo Farmers Mutual Fire Insurance Company
Grove Mutual Fire Insurance Company *
Bluffton Mutual Fire Insurance Company *
Long Lake Mutual Insurance Company
Lund Mutual Fire Insurance Company

Parke Mutual Fire Insurance Company
Roseau County Farmers Mutual Fire Insurance Company *
Farmers Township Mutual Insurance Company, Deerwood
Huntsville Farmers Mutual Insurance Company
North Fork Mutual Fire Insurance Company *
Crow River Mutual Insurance Company
Border Farmers Mutual Fire Insurance Company
Itasca Farmers Mutual Fire Insurance Company *
Lakeland Farmers Insurance Company *
Mid-State Mutual Insurance Company *
New Munich Farmers Mutual Fire Insurance Company *
Palo Farmers Mutual Fire Insurance Association *
Rice County Mutual Insurance Company *
Spring Valley Township Mutual Insurance Company