

PURE VERSUS MUTUAL HEALTH INSURANCE: EVIDENCE FROM SWEDISH HISTORICAL DATA

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ABSTRACT

Using data from voluntary Swedish health insurance societies 1902-1910, this article analyzes the coexistence of pure and mutual insurance societies where pure societies are characterized by charging *ex ante* premiums only while mutuals in addition charge *ex post* assessments. On average, mutual insurance societies are found to be larger and to offer greater insurance coverage per member. Pure insurance societies have, on average, higher insurance coverage per day, greater mean levels of moral hazard controls, a higher mean number of policy categories, and greater longevity.

INTRODUCTION

This study uses a unique historic data set to analyze the coexistence of pure and mutual insurance societies. Although there is a fairly extensive literature on the theoretical differences between these insurance types as well as the nature of their coexistence (see Born et al., 1995; Marshall, 1974; Skogh, 1999; Smith and Stultzer, 1995; van der Linden, 1996; Wu, 2000), empirical work is scant. Pure and mutual insurance are defined by their choice of financing system. Pure insurance societies use *ex ante* premiums only whereas mutual insurance societies in addition to *ex ante* premiums, also excise assessments *ex post*.¹ Mutual insurance is therefore a form of risk sharing between members. This type of insurance is expected to cater to smaller groups of homogenous members, in terms of risk, motivated to control moral hazard

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¹ Pure insurance societies are characterized by policyholders paying a fixed premium in return for a contractually agreed amount from the assets of the insurance society in the event of illness. As such, this insurance form can be related to *stock* insurance as defined by Mayers and Smith (1981). However, as there is a great degree of heterogeneity within the insurance form defined as pure, ranging from employer-provided health insurance to freely formed associations and, more specifically, it is unclear to what degree there is a separation of, and conflict between, stockholders and policyholders, this article will continue to label this type of health insurance society as *pure*. See the section on historical background for further discussion.

problems. The fixed contracts offered by pure insurance societies cater, in turn, to a more heterogeneous, potentially higher-risk clientele which without specific controls, lacks the motivation to minimize moral hazard problems. The purpose of this study is to empirically examine theoretical predictions concerning pure and mutual insurance, as defined by a type of financing system employed.

The data, covering all Swedish *sick and funeral insurance societies*² from 1892 to 1910, were compiled as a result of the 1891 *Law of Registered Sick Insurance Societies* offering an administration subsidy to all insurance societies that freely registered with the government. As such, detailed information concerning both financial and policy variables of insurance societies became available. The pre-1910 insurance market in Sweden was characterized by free entry and exit and was largely unregulated. Insurance societies were free to set their own insurance contracts, premium, and assessment levels, and to determine the type of financial system. This data set therefore provides a unique opportunity to examine insurance theory within the framework of an unregulated and competitive insurance market. The results can shed light on issues concerning the impact of regulation/deregulation on the insurance market by providing one study of the deregulated case. Regulation may otherwise influence the underlying conditions of the insurance market to sustain both insurance types.

The insurance society data provide indicators for variables of interest that are used to analyze differences between pure and mutual insurance. To test the robustness of the initial univariate results when controlling for society membership size and differences in registered sick levels (among others), a logit analysis is performed estimating the probability of insurance society i being pure. Finally, in order to check that systematic differences between societies with longer or shorter registration periods do not influence the results, an analysis is run on a balanced subpanel of insurance societies.

The main results are that mutual insurance societies are not constrained by smaller membership sizes. Pure insurance societies provide greater coverage per day whereas mutuals are, on average, associated with more generous insurance policies per member. Consistent with theoretical predictions, pure insurance societies are found to have more stringent moral hazard controls, a greater mean number of policy categories, and are, on average, older.

The remainder of this article is as follows. The next section provides a brief description of the historical background of this panel data set. This is followed by a section discussing the theoretical work concerning pure versus mutual insurance. The next section describes the data and introduces the main variables of interest for the logit estimation; membership size, insurance benefits, premiums, and moral hazard controls. The following section provides the empirical set-up and is followed by the presentation and discussion of the results. The article is concluded in the final section.

HISTORICAL BACKGROUND

The first Swedish sick and funeral insurance societies were established in the early 1700s within various trade guilds. These societies provided insurance for lost wages and medical expenses in the event of illness or accident as well as for funeral costs

² Direct translation from Swedish.

in the event of death.³ As such, these societies are the equivalent of today's health insurance providers. During the period 1870-1885, there was a surge in establishment associated with this period's rapid industrialization and urbanization. A parliamentary committee⁴ set up in 1884 to study the emerging insurance market observed that the health coverage offered by the existing insurance societies was small⁵ and uncertain in the sense that insurance societies frequently dissolved leaving members without insurance.

In order to stimulate the development of sick and funeral insurance societies, the 1891 *Law of Registered Sick Insurance Societies* implemented an administrative subsidy for those societies that voluntarily registered with the government. Registration implied sending annual financial statements as well as information concerning policy statutes to the *Department of Public Administration*⁶ and after 1901, to the *National Board of Trade*.⁷ Although successful in stimulating the development of especially small insurance societies,⁸ it was apparent that the emerging market had problems both in terms of reaching a greater proportion of the population⁹ and in terms of providing safe insurance options. Fierce competition for members often led to detrimentally low premiums, a high rate of closures, and uncertain coverage (Berge, 1995; Edebalk, 1996). The subsequent 1910 *Law of Registered Sick Insurance Societies* increased regulation while maintaining the voluntary nature of the Swedish health insurance system. Among other regulations, *ex post* assessments were forbidden except for temporary budget deficits. The 1910 law therefore effectively marks the demise of Swedish mutual insurance societies as defined here.

The health insurance providers of that time were characterized by a wide array of organizational forms. There were skills-based societies associated with early trade guilds and trade unions, employer-provided health insurance, so-called *open*¹⁰ societies ranging from worker associations and geographically based associations to fraternity and women's associations. Various special interest groups, such as non-conformist religious organizations and alcohol abstinence groups, also set up health insurance plans for their members. Finally, there were a few national health insurance

³ Funeral insurance levels were specifically kept to low levels so as not to correspond to life insurance.

⁴ *Arbetsförsäkringskommittén*.

⁵ The average amount of health insurance coverage per week was 7:24 SEK (0.70 USD calculated at 1 US\$ = 10.29 SEK) for male members and 5:70 SEK (0.55 US\$) for female members in current prices (Tegendal, 1949). For comparison, note that the average annual income for a manual worker who received board via the employer was 172 SEK (16.70 US\$) at current prices in Sweden in 1893. Our data show an average health insurance coverage of 8:80 SEK (0.85 US\$) per member and week, 1902-1910.

⁶ *Civildepartementet*.

⁷ *Kungliga Kommerskollegiet*.

⁸ In 1892, 221 insurance societies in total registered with the Swedish government. There was slow growth in registration until 1897 when the administration subsidy was increased (increased again in 1899). By 1910, there were 2,426 registered insurance societies in total (Edebalk, 1996).

⁹ In 1905, 85 percent of active health insurance societies were registered covering approximately 14.1 percent of the adult (15 years and older) population (Edebalk, 1996).

¹⁰ *Open* implies insurance societies set up outside the framework of skill or employer affiliation.

providers. Some societies were set up with the sole purpose of providing health insurance, others were set up in conjunction with an existing organization. Depending on organizational form, members were recruited within the given trade guild, place of employment, special interest group, or among the population at large. Members of an organization with other primary objectives than the provision of insurance were not necessarily policyholders in that organization's insurance society.¹¹ Only 6 percent of the organizations stipulated mandatory membership to affiliated insurance societies. Lindeberg (1949) notes that those societies charging premiums only, i.e., pure insurance societies, were characterized predominantly by factory and employer-provided health insurance societies as well as organizations with other primary objectives than the provision of health insurance. As such, pure insurance societies were more likely to be characterized by a delineation between organization members and insurance policyholders. Mutuals, in turn, were more likely to have been set up with the sole objective of providing insurance to members in which case policyholders and members were equivalent. As the society data used in this study do not provide direct information on ownership structures, the definition of pure contra mutual insurance focuses on type of financing system employed.¹²

THEORETICAL BACKGROUND

The coexistence of pure and mutual insurance societies that characterizes the pre-1910 Swedish health insurance market raises the question how these two insurance forms differ. Do they cater to different segments of the market? Is the market large enough or varied enough for the two forms to coexist? Do they offer different insurance options and at different costs? The theoretical work points to a number of differences that this section summarizes in brief.

Mutual insurance is a pooling of risk among members. Mutuals can be defined broadly. van der Linden (1996) for example, defines mutuals as "associations formed voluntarily for the purpose of providing their members with financial assistance in case of need." This article, however, focuses on Skogh's (1999) more stringent definition based on type of financing system employed. Mutual insurance is an agreement on sharing of losses *ex post*. As such it differs from the pure insurance option in which policyholders trade risk with an insurer at a premium fixed *ex ante*. Although mutuals can combine *ex ante* fees with *ex post* assessments and do not necessarily excise assessments every year, pure insurance societies utilize *ex ante* fees only. Marshall (1974) describes the mutuality principle as "a relationship among consumers in its simplest form, individuals take on an obligation to share losses suffered by others. The quid pro quo being the reciprocity of the arrangement" (Marshall, 1974, p. 477). Although pure insurance societies are characterized by policyholders paying a fixed premium for a contractually agreed upon amount in the event of illness and can therefore be

¹¹ Affiliated insurance societies were, however, partially set up to attract members to the main organization (Simonson, 1996).

¹² Historical studies on the Swedish insurance market include Lindeberg (1949), Lindquist (1990), Berge (1995), Edebalk (1996), and Edebalk et al. (1998). A special issue on the topic was published by the *Journal of the Archive and Library of the Swedish Labour Movement* (1999). Included in this issue are studies by Andersson (1999), Edebalk (1999), Grip (1999), Johansson (1999a), and Johansson (1999b). These contributions are in Swedish; however, Simonson (1996) has an English overview published in van der Linden (1996).

compared to *stock* insurance as defined by Mayers and Smith (1981), because of limited information on the stockholder/policyholder relationship, hesitation is warranted in strictly associating pure insurance with stock insurance.

Mutuals arose as an efficient means of addressing contract challenges caused by aggregate uncertainties that hindered pricing and operation, and moral hazard. These two themes dominate as to why mutuals rise and thrive alongside pure insurance societies. The original mutuals were based on implicit or explicit guarantees among members to support each other in the event of an accident or illness. Based on mutual trust, this type of agreement was found among groups that had long-term relationships with one another such as within families, syndicates, unions, and professional groups. As such, mutual sharing of loss is expected among groups with similar risks, common knowledge of possible moral hazard, and repeated exchange, and reputation, or some other form of social control (Skogh, 1999). Defaulting on assessments is therefore partially prohibited by limited alternative insurance options and by assumed negative social repercussions.¹³

Risk sharing in the mutual insurance framework is based on the presumption that all in the pool face the same risks (Skogh, 1999). Agents assume that they are faced with the same potential losses and the same underlying probabilities of loss. The actual probabilities are not known *ex ante* but as information about risk develops, mutuals may have to adjust their policies. In addition, the mutual insurance form developed to serve a clientele committed to risk reduction and the control of moral hazard. One way of inducing appropriate behavior to minimize risk probabilities is to have policyholders bear part of the profit risk associated with aggregate variability. The *participating contract*, i.e., contracts that allow taxation of assessments *ex post*, of the mutual insurance form serves this function (Smith and Stutzer, 1995).¹⁴

As mutual societies expand in terms of membership, trust among members may diminish leading to the need for premiums *ex ante* in addition to the characteristic assessments *ex post*. Wu (1999) shows that as information about risk becomes available, mutuals develop similar contract solutions for different risk groups and for asymmetric information as pure insurance societies. This holds despite the assumption that mutuals have an institutional form used to control adverse selection and moral hazard problems. Low-risk members signal their type by purchasing participating contracts from mutual cooperatives, whereas high-risk members prefer insurance contracts with fixed premiums. Although members in the same mutual are assumed to have similar risks and presumably know the insured risk better than insurers, growth may necessitate policies dealing with issues of asymmetric information.

One of few previous empirical studies on the coexistence of stock and mutual insurance societies, Born et al. (1995) find that historically, the mutual insurance form was able to offer lower fees than stock insurance.¹⁵ Several reasons for this are stipulated. Mutuals ameliorated monitoring problems. Mutuals screened prospective members

¹³ The data used in this study confirm that many mutuals during the observation period were set up in rural areas and among, for example, women's groups, presumably due to the lack of existing alternative insurance options.

¹⁴ Note that dividends were not paid out to policyholders during this time period.

¹⁵ Born et al. (1995) analyze the coexistence of mutual and stock insurance companies in the U.S. property-casualty insurance industry.

in an effort to insure only the better risks. Mutuals offered services such as loss prevention recommendations. Members were seen as participants in a long-term relationship. Finally, the common interest of mutual members in reducing insurance costs may have reduced moral hazard problems.¹⁶ Born et al. also find that relative to mutuals, pure insurance societies are more likely to reduce their business in unprofitable situations. For a given amount of premiums, pure insurance companies have larger losses than mutuals. Their results are consistent with the theoretical arguments that mutuals are more careful in screening and better able to attract lower risk members.

DATA DESCRIPTION

The data, compiled first by the Department of Public Administration and after 1900, by the National Board of Trade, contain annual information in published tables for all registered Swedish sick and funeral insurance societies from 1892 to 1910. The society data consist of two sets: financial accounts and policy statutes. The financial accounts contain detailed information on income and expenses, number of members, registered sick cases and sick days, all by gender, as well as information regarding assets and debts. The policy statutes yield information concerning optional or mandatory membership, number of policy categories, age and sex restrictions for membership, premium and assessment levels, regulations regarding eligibility for health and funeral coverage, as well as benefit levels.¹⁷

The data used in this article come from two regions, Stockholm City and Östergötland County. These regions were chosen in order to include both a larger metropolitan area and a more rural area.¹⁸ The two regions are equally represented in Stockholm, whereas pure insurance is relatively more prevalent in Östergötland.¹⁹ Note that Stockholm societies tend to be larger and more expensive, both in terms of costs to members in the form of premiums and assessments and in terms of society costs in the form of expenses for health coverage.

The data from 1892 to 1901 are dropped due to poor registration compliance. What is left is a data set that consists of annual information from a total of 493 registered societies (3,849 observations) divided between 222 mutual insurance societies (1,770 observations) and 271 pure insurance societies (2,079 observations). The insurance societies are coded as pure insurance societies if they register income from initial fees and annual premiums only and as mutuals if they, in addition, register income from assessments during any of the 9 years under observation. The policy data give information on assessment levels due to illness among all members, i.e., the amount taxed for health insurance per week and member. However, only 13 societies stipulate assessment levels in the statutes (103 observations), presumably the majority of mutuals maintained the freedom to charge varying assessment levels. For this reason the definition of pure contra mutual insurance focuses on the societies' revenue statistics and not on the policy variables.

¹⁶ A contrary view is provided by Marshall (1974) who postulates that most mutuals avoid using assessments by charging sufficiently high initial premiums.

¹⁷ See Appendix for variable list and definitions.

¹⁸ Selection of only two regions is also motivated by the large amount of data in published tables that must be transferred into machine-readable format.

¹⁹ 58.5 percent of Östergötland societies were pure insurance societies.

TABLE 1

Number of Registered Sick Insurance Societies and Members in Stockholm and Östergötland, 1902-1910

Year	Total		Mutual Insurance		Pure Insurance	
	Societies	Members	Societies	Members	Societies	Members
1902	354	94,706	165	56,014	189	38,692
1903	382	105,031	181	60,931	201	44,100
1904	410	117,132	191	67,281	219	49,851
1905	424	125,138	197	71,774	227	53,364
1906	441	135,666	204	76,063	237	59,603
1907	455	146,737	210	81,832	245	64,905
1908	459	152,443	211	85,700	248	66,743
1909	464	161,758	213	90,708	251	71,050
1910	454	166,341	204	90,372	250	75,969

Of the 493 registered insurance societies in Östergötland and Stockholm between 1902 and 1910, 325 existed during the entire observation period (*survivors*). The remaining either entered or exited (or both) the data set at some point between 1902 and 1910.²⁰ Registered societies also competed with nonregistered societies, for which little information exists. Attrition from the unbalanced to the balanced subpanel may be a product of entering or exiting insurance societies choosing to begin or end the registration process, establishing after 1902 or dissolving before 1910 (or both). Briefly, *entry societies* have larger mean annual income, per member, from premiums and assessments as well as stating higher, on average, annual premiums in their policy statutes.²¹ *Entry societies* also appear to have lower expenses for health coverage per income from premiums and assessments.²² *Exit societies* are characterized by significantly and considerably smaller mean membership levels.²³ *Exit societies* also had significantly higher mean levels for expenses on insurance benefits while stating significantly smaller premium levels.²⁴

The theoretical differences between pure and mutual insurance societies are to a large degree based on how insurance societies' choice of financing system influences membership, both in terms of risk types and in terms of policyholder behavior. As such,

²⁰ Of the 168 insurance societies in the data set that had less than nine observations, 139 entered after 1902, 39 exited before 1910, and 10 societies both entered and exited between 1902 and 1910. Some insurance societies may have merged with others, a process not controlled for other than they cease to be registered under the old name, i.e., exit from the data set.

²¹ See Tables A1 and A2 in the Appendix.

²² See mean for variable *coverage per annual total fees*, Table A1.

²³ Lindeberg (1949) describes the brief existence, during the observation period, of insurance societies with stipulated maximum membership levels. Exit from the data may therefore be a consequence of problems associated with small membership size.

²⁴ Note that pure insurance societies are relatively more prevalent than mutuals among *survivors* and *entry societies*, 54 percent of *survivors* are pure insurance societies and 55 percent of *entry societies*. Exit from registration is evenly spread between the two insurance types. Note also that there is more volatility in Stockholm; 60 percent of entry and 67 percent of exits occurs among Stockholm insurance societies.

TABLE 2

Sample Means by Type of Insurance Society, Mutual Contra Pure: Financial Accounts

Financial Accounts	Mutual Insurance	Pure Insurance
Members*	423 (1,354)	273 (488)
Coverage/member*	7.83 (3.83)	6.61 (3.67)
Coverage/sick day	1.30 (0.63)	1.31 (0.74)
Coverage/sick case ^a	35.08 (23.93)	34.10 (18.23)
Coverage/annual tot. fee	0.85 (0.39)	0.85 (0.38)
Medical exp./sick day*	0.01 (0.06)	0.03 (0.12)
Medical exp./sick case*	0.38 (1.61)	0.63 (2.48)
Average premium ^b	8.28 (4.12)	8.07 (3.72)
Average assessment	2.49 (5.16)	—
Average balance*	1.88 (3.09)	3.06 (4.63)
Average assets*	26.46 (22.94)	43.63 (64.87)
Average debt*	0.22 (1.34)	2.83 (45.11)
Debt/asset*	0.09 (1.19)	0.01 (0.16)
Ratio of female members*	0.31 (0.26)	0.29 (0.25)
Average administration cost*	1.63 (1.23)	1.35 (1.11)
Average variable cost*	9.46 (5.62)	7.91 (6.17)
Average sick cases*	0.23 (0.07)	0.21 (0.08)
Average sick days*	6.2 (2.4)	5.6 (2.6)

Notes: Standard deviation in parenthesis.

*indicates significant difference at 1 percent level; **at 5 percent level, in means test. See Appendix for variable definitions.

^aMean coverage per sick case is significantly larger for mutual insurance societies compared to pure insurance societies at the 10 percent level.

^bThe means test for this variable indicates a significant difference at the 10 percent level. The mutual mean is significantly larger than the pure insurance mean at the 5 percent level.

one would optimally like to study individual insurees' choice of insurance society and the personal characteristics of these members. Lack of individual data prevent this. The available society data, however, can give an indication of membership characteristics. As such, the remainder of this section provides a thorough description of the society variables used in the logit estimations and the characteristics these variables aim to capture.

Membership Size

The mean for membership size, shown in Table 2, indicates that mutual insurance societies tend to be larger than pure insurance societies, although the variation in size is also much greater.²⁵ Mutuals remain larger despite removal of outliers and across both regions.²⁶

²⁵ Of the population of mutuals, 5 percent are larger than 1,031 members during the period 1902-1910. This corresponds to 12 mutual insurance societies that are outliers in terms of size during some or all of the observed years.

²⁶ Mean members (SD in parenthesis); Stockholm: Mutuals 512 (1,488), Pure 327 (481); Östergötland: Mutuals 195 (213), Pure 180 (143).

TABLE 3

Sample Means by Type of Insurance Society, Mutual Contra Pure: Policy Statutes

Policy Statutes	Mutual Insurance	Pure Insurance
Minimum age**	16.37 (1.41)	16.26 (1.52)
Maximum age**	48.81 (7.32)	48.16 (9.39)
Minimum initial fee*	2.17 (2.96)	2.75 (5.25)
Maximum initial fee*	2.73 (3.35)	3.11 (5.40)
Minimum premium*	8.31 (4.30)	7.88 (3.99)
Maximum premium*	8.60 (4.66)	8.24 (4.47)
Assessment (illness)	0.18 (0.26)	–
Assessment (funeral) ^a	0.88 (2.48)	0.47 (0.05)
Guarantee fee ^b	0.24 (1.79)	–
Waiting time (illness)*	78.0 (67.3)	95.1 (69.4)
Waiting time (funeral)*	60.1 (70.6)	93.1 (147.3)
Qualifying time*	0.25 (1.2)	0.75 (5.5)
Minimum duration	5.4 (2.6)	5.3 (3.7)
Full coverage	63.0 (32.5)	63.3 (32.6)
Half coverage	5.0 (26.7)	5.5 (19.4)
Full coverage per case	32.6 (72.7)	29.4 (67.0)
Half coverage per case	57.8 (182.2)	48.6 (181.8)
Coverage per week	8.85 (3.78)	8.76 (4.23)

Notes: Standard deviation in parenthesis.

*indicates significant difference at 1 percent level; **at 5 percent level, in means test.

^aThere are seven pure insurance societies that register assessment values for funeral insurance only in their policy statutes yet no income from assessments.

^bThere are eight mutual insurance societies that charge a guarantee fee (56 observations). The size of this fee ranges from 3 to 25 SEK.

Insurance Benefits

Insurance benefits comprise two dimensions, level and duration. Lack of individual data prevent analysis of individual insurance solutions; however, the society data provide indicators of insurance provision. The sample means for policy variables (Table 3), show that mutuals did not stipulate, on average, significantly higher health insurance *coverage per week* nor did they specify longer insurance coverage duration (*full coverage*, *half coverage*).

Using the financial data on each society's expenses for health insurance benefits, three indicators for insurance coverage were generated; *coverage per member*, *coverage per sick case*, and *coverage per sick day*. Two of these show that mutuals had, relative to pure insurance societies, significantly greater expenses for health benefits.²⁷ The policy variables therefore do not indicate significantly higher or longer health insurance coverage for mutuals although actual expenses for health benefits appear to differ across insurance types.²⁸

²⁷ Mean *coverage per sick case* is significantly larger for mutual insurance societies compared to pure insurance societies at the 10 percent level.

²⁸ One can mention that medical coverage, i.e., reimbursements for physician care or medicine, was on average larger, within the pure insurance form. This form of coverage was not,

A further indicator of insurance coverage is the amount, per society, spent on insurance benefits relative to revenue from premiums and assessments. The mean for *coverage per annual total fees*, shows no significant differences across insurance types.

Insurance Premiums

The policy data contain information on initial membership fees as well as annual premiums. Assessment levels are also given for both health and funeral coverage, posted *ex ante*, i.e., indicate the amount each member is taxed for illness or death among all members.²⁹ The total costs of insurance to members within mutuals is therefore *ex ante* difficult to appreciate as members may have incomplete knowledge of illness probabilities within any given mutual society. The sample means for these policy variables indicate that mutuals charged significantly lower initial fees but higher annual premiums, on average, than pure insurance. As members of mutuals have a positive probability of being charged an assessment *ex post*, it appears that mutual insurance is, on average, annually more expensive to members.

The financial data provide information on registered annual revenue per society, stemming from initial fees, annual premiums, and assessments. These variables indicate that mutuals had significantly greater revenue per member stemming from membership fees than pure insurance societies. The mean for *average premium* is significantly larger at the 10 percent level and this variable does not take into consideration the added expense to members of assessments. Mutuals, therefore, appear to spend more per member on insurance benefits but at a greater expense on average, to members.³⁰

Moral Hazard Controls

There are three registered controls for benefit eligibility in the policy data.³¹ The first of these is *waiting time* after entry for insurance eligibility. In addition, the societies could use a *qualifying time* after the onset of illness for insurance coverage; for example, health insurance may be paid only from the third registered day of illness. Finally, *minimum sick days* stipulates the minimum duration of an illness for which insurance benefits are paid.³² The data indicate that the pure insurance form had significantly

however, used extensively among Swedish sick and funeral insurance societies (Lindeberg, 1949). In our data, 75 percent of societies had zero expenses for medical outlays. This is true for both pure and mutual insurance societies.

²⁹ A majority, 95 percent, of mutual insurance societies do not specify assessment levels in the policy data.

³⁰ Two out of three indicators for registered illness levels show that mutual members register significantly higher mean levels. This may be a result of more generous insurance policies or, alternatively, may be the reason for greater expenses on insurance provision within mutuals.

³¹ *Guarantee fees* are also registered but used only by the mutual insurance form.

³² In the data it is common that insurance societies avail themselves of one or the other of the latter two controls. When both are used, the stipulations tend to follow each other. For example, the qualifying time may be 6 days and the minimum duration 7 days. In other words, no insurance coverage is paid for the first 6 days of a registered illness and 7 days must be registered for any insurance to be paid out, thereby giving the ill policyholder in this example, 1 day of insurance coverage for 1 week out of work due to illness.

longer mean *waiting times* for insurance coverage eligibility, as well as a longer mean *qualifying time* after onset of illness.³³ There is no significant difference between the insurance types regarding mean *minimum sick days*. The percentage of each type of society using the available controls does not differ dramatically.³⁴

Financial Status, Age, and Number of Policy Categories

Several variables indicating financial status are available, *average balance*, *average assets*, and *average debt*. Financial status is of interest because if systematic differences exist between insurance types, this may be an indication that one insurance type has more successfully matched premium and benefit levels to risk types. Pure insurance societies yield significantly higher mean levels for all three.³⁵ The *debt–asset* ratio gives an indication of financial viability; pure insurance societies have a significantly lower mean *debt–asset* ratio than mutual insurance societies.

Pure insurance societies are, on average, significantly older than mutual insurance societies and have a greater number of policy options.³⁶

EMPIRICAL SET-UP

Using the available financial and policy variables, a between-logit analysis is performed in order to analyze the differences in pure and mutual insurance societies with respect to the given independent variables. Between estimation implies that the logit estimation is based on the mean values of the explanatory variables, per society over time. This is due to the fact that the dependent variable, type of financing system, is constant over time by definition.³⁷ In order to study the impact of society

³³ Note that the variable *mean qualifying time* after onset of illness shows large variation among pure insurance societies. The range for mutual insurance societies using this form of moral hazard control is from 1 to 15 days. For pure insurance societies the range is from 1 to 100 days. However, only 5 percent of pure insurance observations exceed 8 days. Three pure insurance societies have significantly larger values for qualifying time, *Seperators arbetares shk. (sbk.)* (Seperator's Worker's Health Insurance Society) with an annual value of 70 days, *Stockholms fortsättningskassa* (Stockholm's Insurance Continuation Society) with 90 days, and *Återförsäkringsföreningen "Gemensamhet" i Åtvidaberg* (Re-insurance Society 'Togetherness' in Åtvidaberg) with 100 days. The latter two appear to be "re-insurance" societies that provide insurance first after the initial insurance benefits are depleted for members with long-term illnesses. It would then be in line with this type of insurance to set longer qualifying times for health insurance coverage.

³⁴ The percentage of societies indicating nonzero levels of the following moral hazard control variables, by type of insurance society: *waiting time illness*: mutuals 58.3%, pure insurance 54.8%; *qualifying time*: mutuals 11.0%, pure insurance 13.7%; *minimum sick days*: mutuals 88.5%, pure insurance 90.8%.

³⁵ The pure insurance mean for average debt is affected by an outlier. *Allmänna sbk. i Stockholm* (Stockholm General Health and Funeral Insurance Society) had average debt levels exceeding 500 SEK/member (48.50 US\$) across all observed years. Other pure insurance societies ranged from 3 to 16 SEK/member at the upper end of the distribution.

³⁶ Over 90 percent of both insurance types, however, offer a maximum of two policy options.

³⁷ There are mutual societies that were varied in their use of assessments from year to year; pooled estimation is therefore possible but not consistent with the definition of type of financing system used here.

characteristics on the probability of being pure insurance, between-logit estimation is run on variations of the following basic model.

$$\text{Prob}(Ins_i = 1) = f(\mathbf{M}_i, \mathbf{B}_i, \mathbf{P}_i, \mathbf{MH}_i, \mathbf{FS}_i, \mathbf{A}_i, \mathbf{PC}_i, \mathbf{Z}_i). \quad (1)$$

The dependent variable, Ins_i is a dummy variable equal to one if society i is a pure insurance society. The explanatory variables are as follows: $\mathbf{M}_i$ indicates average membership size of society i , $\mathbf{B}_i$ indicates average insurance benefits per society, $\mathbf{P}_i$ indicates average premium levels, $\mathbf{MH}_i$ stands for moral hazard control levels, $\mathbf{FS}_i$ for the variables measuring society financial status, $\mathbf{A}_i$ indicates the age of society i , and $\mathbf{PC}_i$ indicates number of policy categories of respective society. In addition, a number of control variables are used, denoted by $\mathbf{Z}_i$. These include organization (skill- or employer-based, open, special interest, and national) and region dummies, ratio of female members, two indicators for administration costs associated with processing insurance claims (*average administration cost* and *average variable cost*), and two indicators for registered sick levels per society (*average sick days* and *average sick cases*).

Many of the independent variables are represented by several indicators. As such, four model specifications are estimated using different indicators for the independent variables. This is done in order to ascertain the robustness of the coefficients as well as to avoid multicollinearity problems. Model 1 includes all available indicators including administration costs. Models 2-4 use combinations of the independent variables that minimize correlations between independent variables. Model 4 also includes organization and region dummies. As the indicators for insurance benefits especially, premiums and sick levels are highly and significantly correlated, a principal component analysis on these variables is also performed and used in the estimation of Model 1.

Note that this is a so-called unbalanced panel in that there is entry and exit of societies during the 9-year period under observation and that there are competing unregistered insurance societies at the time, for which there are no available data. Selection from the unbalanced to the balanced subpanel may be nonrandom yielding biased estimation results.³⁸ A balanced subpanel is created consisting of 2,925 observations over insurance societies that had annual observations registered for the entire 1902-1910 period. The above model specifications are reestimated on this balanced subpanel. The idea is to use all available dimensions of the data in order to fully check the stability of the reported results.

RESULTS

Results, reported in Table 4, show that higher mean levels of the following variables are significantly and consistently associated with a positive likelihood of the society being a pure insurance society: *coverage per sick day*, *coverage per annual total fees*,³⁹ *initial fees*, *waiting time*, *qualifying time*, *average assets*, *society age*, *number of policy categories*. Higher

³⁸ Duration analysis is not completed as exit from the data does not imply exit from the insurance market. As such, results from duration analysis would be difficult to interpret.

³⁹ This variable includes all society revenue stemming from insurance payments from members, i.e., includes assessments *ex post*.

TABLE 4

Logit Estimation, Unbalanced Panel (Dependent Variable: Pure Insurance Societies)

		1	2	3	4
Members/10	f	-0.020** (0.006)	-0.007 (0.005)	-0.011*** (0.006)	-0.011*** (0.006)
Coverage/week	p	0.016 (0.023)	0.006 (0.013)	—	—
Coverage/member	f	-0.227* (0.070)	—	—	—
Coverage/sick day	f	1.586* (0.230)	—	0.755* (0.109)	—
Coverage/sick case	f	-0.027 (0.008)	—	—	—
Coverage/total fees	f	2.736* (0.316)	—	1.937* (0.190)	0.805* (0.002)
Maximum initial fee	p	0.071* (0.009)	0.016** (0.008)	0.030* (0.013)	—
Maximum premium	p	-0.123* (0.021)	—	0.035* (0.012)	—
Average premium	f	0.785* (0.049)	-0.090* (0.017)	—	0.069* (0.015)
Waiting time	p	0.003* (0.001)	0.002* (0.001)	0.003* (0.001)	0.003** (0.001)
Qualifying time	p	0.195* (0.007)	0.125* (0.036)	—	0.044* (0.021)
Minimum duration	p	0.006 (0.017)	—	-0.009 (0.012)	—
Average assets	f	0.034* (0.003)	0.023* (0.002)	—	0.018* (0.002)
Average debt	f	0.013 (0.010)	—	0.022* (0.004)	-0.017* (0.005)
Average balance	f	-0.225* (0.033)	-0.005 (0.020)	0.184* (0.020)	—
Society age	f	—	—	—	0.008* (0.002)
Number of policy options	p	—	—	—	0.131* (0.047)
Average sick days	f	0.146* (0.038)	-0.029 (0.021)	—	—
Average sick cases	f	-4.876 (1.133)	—	-1.867* (0.623)	-7.174* (0.689)
Constant		-2.744* (0.380)	1.457* (0.214)	-1.773* (0.259)	-0.591* (0.275)
Pseudo- R^2		0.2222	0.1314	0.1029	0.1101
Number of observations		3835	3843	3835	3763

Notes: Explanatory variables are mean levels per society. Standard errors are in parenthesis. f/p indicates if explanatory variables originate from financial accounts or policy statutes.

*indicates significance at 1% level; **at 5% level; ***at 10% level. Other control variables are average administration cost and average variable cost in Models 1 and 3, and organization and region dummies as well as ratio of female members in Model 4.

mean levels of the explanatory variables—*members*, *coverage per member*, and *average sick cases*—are significantly and consistently associated with a lower probability of being a pure insurance society.

Indicators of insurance benefits to members vary in sign. The variable mean *coverage per member* yields a negative and significant coefficient whereas the variable mean *coverage per sick day* has a positive and significant coefficient. Controlling for registered sick levels among members, therefore, alters the results based on univariate analysis. The results here suggest that higher coverage per day is associated with pure insurance solutions whereas greater insurance coverage per member is associated with mutual insurance societies. Note that *coverage per member* takes into account both dimensions of insurance coverage, i.e., level and duration, implying that more generous individual health insurance solutions are associated with mutual insurance societies.

Indicators of premiums yield the following results. Higher initial fees are significantly and positively associated with pure insurance societies whereas the coefficients for annual premiums vary in sign. One cannot therefore state with certainty that mutuals charge on average higher annual premiums as indicated in the initial univariate analysis. Together with the above results concerning benefit levels, empirical support is provided for the theoretical prediction that mutuals are able to provide more generous insurance solutions to members, despite lower initial fees and controlling for differences in annual premiums and registered sick days.⁴⁰

The variable measuring society expenses for insurance coverage to members per revenue from premiums and assessments, i.e., *coverage per total fees*, yields a positive significant coefficient in all model specifications. Pure insurance societies are associated with, on average, greater expenses on insurance benefits relative to society revenue from premiums. In means tests, this variable did not significantly differ between pure and mutual insurance societies. The positive coefficient here can be interpreted as an indicator that members of pure insurance societies are getting more health insurance for their money or, as the variable is based on society financial data, as a signal of precarious policies in the form of overly generous benefits relative to premiums on the part of pure insurance societies.

As the mutual insurance form presupposes membership homogeneity in terms of risk profiles and has a built-in institutional form, the participating contract, to minimize moral hazard, one would expect the pure insurance form to more frequently use controls for moral hazard as well as to set higher levels. The coefficients for the moral hazard control variables, mean *waiting time*, and mean *qualifying time* are positive and significant indicating that these variables are positively associated with the society being pure instance. These results therefore support the prediction that pure societies must more actively meet moral hazard problems.

That older societies are associated with pure insurance societies supports the prediction that this type of society develops as actuarial information improves over time. A higher mean number of policy categories is associated with a significant likelihood

⁴⁰ Although pure insurance is associated with greater insurance per sick day, this is, as mentioned, only one component of insurance coverage and therefore not inconsistent with the finding that mutual insurance is associated with greater insurance coverage per member that incorporates both dimensions.

of the society being pure which is also consistent with the theoretical observations that pure insurance societies attract a more heterogeneous clientele, in terms of risk and need to differentiate among these risk groups. A higher mean number of policy categories is also dependent on the development of actuarial information that occurs over time and is therefore consistent with the observation that pure insurance societies are, on average, older.⁴¹

Multicollinearity is a potential problem. In order to minimize this problem, principal component analysis was used to group together the variables that are collinear into a composite index capable of representing the group by itself. Model 1 was then reestimated interchanging the principal component for the group of correlated variables. This was done for the following groups where correlations among the variables were above 50 percent: insurance benefits, annual premiums (excluding initial fees), the financial variables average assets, and average debts, and registered sick levels. The principal component for insurance benefits is positive and significant,⁴² as is the principal component for annual premiums and financial variables. The principal component for registered sick levels is negative but insignificant. The principal component analysis therefore largely confirms the above-reported results with the exception that the principal component coefficient for annual premiums supports the result that pure insurance is associated with higher mean annual premiums.

Logit estimation on the unbalanced panel including the selection terms n_i , the number of years health insurance society i is observed and *survivor*, a 0–1 variable equal to 1 if insurance society i is observed in all nine periods, yield that frequency of observations, n_i , has a negative significant coefficient whereas survivor is insignificant. The selection terms therefore indicate that insurance societies with a greater number of observations are associated with a lower likelihood of being pure insurance, when controlling for other observable factors.

Logit estimation of the balanced subpanel yield results⁴³ that do not greatly differ from the unbalanced panel results.⁴⁴ The main results from the unbalanced panel estimation are upheld indicating that selection bias between the balanced and unbalanced panel is not an issue. This implies that although the balanced subpanel is composed of a selection of insurance societies observed during the entire 1902–1910 period and are therefore characterized by greater stability and longevity, this does not affect the likelihood of being a pure contra mutual insurance society.

⁴¹ Reported results are robust to inclusion of control variables for organizational form, region, ratio of female members, and administration costs.

⁴² The coefficients are as follows (standard errors in parenthesis)—insurance benefits: 0.264 (0.078), annual premiums: 0.801 (0.077), financial variables: 2.345 (0.185), registered sick levels: –0.011 (0.080).

⁴³ Results from the logit estimation on the balanced subpanel are available from author on request.

⁴⁴ Differences include that mean *coverage per week* yields a negative significant coefficient in model 1. The principal component for this group of intercorrelated variables indicating health insurance benefit levels, however, remains positive. The moral hazard control variable, *minimum sick days*, is significantly associated with pure insurance societies reinforcing the result that higher levels of moral hazard controls increases the likelihood of the society being pure.

CONCLUSIONS

This study, based on unique data from voluntary Swedish sick and funeral insurance societies, 1902-1910, has systematically analyzed differences between pure and mutual insurance and, in a multivariate analysis, estimated the probability of being a pure insurance society. The results reported are obtained from a short panel over a period of Swedish health insurance history characterized by extreme competition, lack of regulation, and free entry and exit. As such, the study provides an indication as to whether theoretical predictions concerning pure contra mutual insurance are supported by available data.

Mutual insurance societies were found, on average, to be significantly larger in terms of membership size than pure insurance societies, despite theoretical predictions to the contrary. In terms of insurance benefits the data indicate that pure insurance societies are associated with greater coverage levels per registered sick day whereas mutual insurance societies are associated with greater insurance benefits per member. As the latter variable incorporates both level and duration of insurance benefits whereas the former only indicates level, mutual insurance is associated with more generous insurance solutions to members. In terms of the cost of this insurance to members, the analysis unequivocally shows that pure insurance societies charged higher mean initial fees. The results for annual premiums are, however, not robust and nothing conclusive can be said about differences across insurance types in terms of annual costs to members for health insurance.

Pure insurance societies are associated with significantly greater levels of moral hazard controls, have a higher mean number of insurance policy categories and are, on average, older. These results are consistent with the theoretical predictions that mutuals have built-in controls for moral hazard problems and that pure insurance societies cater to a more heterogenous clientele using actuarial information accumulated over time.

This study therefore provides empirical support for the theoretical prediction that, due to more careful screening and selection of members, and built-in controls for moral hazard problems, mutuals are able to provide more generous insurance solutions to members, controlling for differences in initial fees and registered sick days. Support is also found for the hypothesis that pure insurance societies attract a more heterogenous clientele lacking the motivation to minimize moral hazard problems as indicated by a higher mean number of policy categories and by higher mean levels of moral hazard controls.

APPENDIX

Category Variables and Definitions

Members (M_i): Total number of members per society.

Insurance Benefits (B_i):

<i>Coverage per week</i>	Amount (SEK) per week for income loss due to illness, per society.
<i>Coverage per member</i>	Coverage/member, per society.

<i>Coverage per sick day</i>	Coverage/(registered sick day), per society.
<i>Coverage per sick case</i>	Coverage/(registered sick case), per society.
<i>Coverage per total annual fees</i>	Coverage/(annual premiums + assessments), per society.

Premiums (P_i):

<i>Maximum initial fee</i>	
<i>Maximum annual premium</i>	
<i>Average premium</i>	(Annual fees)/member, per society.

Moral Hazard (MH_i):

<i>Waiting time</i>	No. of days after purchase of policy for health insurance eligibility.
<i>Qualifying time</i>	No. of days after registration of illness for which no insurance benefits are paid.
<i>Minimum sick days</i>	Minimum no. of days of illness before insurance benefits are paid.

Fiscal Status (FS_i):

<i>Average assets</i>	Assets/member, per society.
<i>Average debt</i>	Debt/member, per society.
<i>Average balance</i>	Balance/member, per society.

Society Age (A_i): No. of years since establishment.**Policy Categories (PC_i):** Number of policy categories, per society.**Control variables (Z_i):**

<i>Region</i>	Östergötland, Stockholm.
<i>Organizational form</i>	Skills-based, employer-based, open, special interest, or national.
<i>Ratio of female members</i>	(Female members)/members, per society.
<i>Average administration cost</i>	(Administration cost)/member, per society.
<i>Average variable cost</i>	(Total expenses – administration cost)/member, per society. <i>Average sick days</i> – (Registered sick days)/member, per society.
<i>Average sick cases</i>	(Registered sick cases)/member, per society.

TABLE A1

Sample Means, Survivors, Entry Societies, and Exit Societies: Financial Accounts

Financial Accounts	Survivors	Entry Societies	Exit Societies
Members	342 (917)	241 (412)*	141 (121)*
Coverage/member	7.04 (3.60)	7.44 (4.49)*	8.00 (3.52)*
Coverage/sick day	1.26 (0.61)	1.46 (0.95)*	1.38 (0.49)*
Coverage/sick case	33.02 (14.50)	39.33 (36.11)*	38.84 (23.52)*
Coverage/annual tot. fee	0.87 (0.39)	0.79 (0.37)*	0.84 (0.32)
Medical exp./sick day	0.02 (0.10)	0.01 (0.09)**	0.03 (0.08)
Medical exp./sick case	0.52 (1.98)	0.42 (2.50)	0.69 (2.44)
Average premium	8.01 (3.87)	8.71 (4.11)*	8.55 (3.49)**
Average assessment	2.21 (3.20)	3.39 (9.89)*	2.82 (2.87)
Average balance	2.41 (3.28)	3.15 (6.23)*	1.87 (3.67)**
Average assets	37.13 (55.55)	29.43 (27.04)*	40.74 (43.79)
Average debt	2.04 (37.94)	0.27 (1.20)	0.26 (1.01)
Debt/asset	0.01 (0.10)	0.12 (0.85)*	0.02 (0.05)

Notes: Survivors are insurance societies with nine observations, i.e., existed during the entire observation period, entry societies denotes the group of societies that began registration after 1902, and exit societies are those that ceased registration before 1910. Standard deviation in parenthesis.

*Indicates significant difference at 1% level; **at 5% level, in means test, in comparison to survivors.

TABLE A2

Sample Means, Survivors, Entry Societies, and Exit Societies: Policy Statutes

Policy Statutes	Survivors	Entry Societies	Exit Societies
Minimum initial fee	2.44 (4.25)	2.85 (5.10)*	2.08 (3.81)
Maximum initial fee	2.96 (4.50)	3.12 (5.25)	2.41 (4.02)**
Minimum premium	7.99 (3.94)	8.86 (4.52)*	6.48 (4.84)*
Maximum premium	8.29 (4.36)	9.28 (5.02)*	6.78 (4.95)*
Assessment (illness)	0.01 (0.06)	0.00 (0.01)	0.01 (0.03)
Guaranty fee	0.04 (0.47)	0.35 (2.53)*	0.33 (1.25)*
Waiting time (illness)	88.67 (62.46)	77.40 (52.01)*	95.13 (150.54)
Waiting time (funeral)	76.03 (85.77)	73.97 (121.07)	111.58 (322.02)*
Qualifying time	0.48 (3.97)	0.80 (5.19)**	—
Minimum sick days	5.46 (2.38)	4.90 (5.48)*	4.81 (3.02)*
Full coverage	65.21 (30.88)	56.69 (34.41)*	56.38 (42.65)*
Half coverage	5.17 (24.26)	5.34 (18.31)	5.90 (18.33)
Full coverage per case	30.12 (69.80)	34.67 (72.61)	24.89 (52.19)
Half coverage per case	50.30 (179.34)	61.09 (183.85)	51.26 (193.82)
Coverage per week	8.54 (3.04)	10.04 (6.17)*	7.84 (5.38)*

Notes: See Notes, Table A1.

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