NBER WORKING PAPER SERIES

THE MORAL HAZARD OF INSURING THE INSURERS

James G. Bohn
Brian J. Hall

Working Paper 5911

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 1997

This paper is part of the NBER project on Property and Casualty (P&C). We thank David Scharfstein, Christopher McGhee, Anne Gron and Neil Doherty for helpful comments and Tom Gunderson for excellent research assistance. This paper is part of NBER's research program in Public Economics. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

State guaranty funds are quasi-governmental agencies that provide insurance to policyholders against the risk of insurance company failure. But insurance provided by guaranty funds, like all insurance, creates moral hazard problems, especially for companies that are insolvent or near-insolvent. The key insight of this paper is that because of the time lag between premium payments and losses (which is especially lengthy in long-tail lines), writing policies is one way for insurance companies to borrow money (i.e., from policyholders). Moreover, the existence of guaranty fund insurance enables insurance companies, even very risky ones, to borrow from policyholders at rates that do not reflect the insurer's default risk. Thus, one way for insurance companies to game the guaranty fund system is to engage in excessive premium writing. Consistent with this idea, we find that insolvent P&C insurance companies tended to have very high premium growth before they failed. More than one-third of the failed insurance companies had premium growth of more than 50 percent in the two years before failure. Moreover, this excessive premium growth was more pronounced in long-tail lines than in short-tail lines. We also find evidence that greater regulatory resources are associated with less gaming of the system.

James G. Bohn
Board of Governors of the
Federal Reserve System
20th and Constitution Avenue, NW
Washington, DC 20551

Brian J. Hall
Department of Economics
Harvard University
Cambridge, MA 02138

The Moral Hazard of Insuring the Insurers

1. Motivation

It has long been understood that insurance creates both benefits -- risk-reduction -- and costs -- moral-hazard induced distortions to incentives. The existence of so many insurance contracts in the market suggests that in a wide variety of cases, the benefits exceed the costs of insurance coverage. But what happens if the insurance company providing insurance fails and is unable to pay off policyholders? Presumably there should be a market for insurance against insurance company failure. But this just pushes the problem back a step. What if the insurer of the insurer fails? If consumers desire genuine protection against risk, the market, with or without the government's help, must figure out how to insure the insurers.

In the United States, the response to this problem has been the organization of quasi-governmental "guaranty funds"at the state level, each of which serves as the insurer of the insurance companies operating in that state. The state guaranty funds are implicitly backed by the state government, giving policyholders reasonable certainty that their claims will be paid even if their insurance company goes broke.

But just as insurance distorts incentives to individuals, the second-level insurance provided by the guaranty funds distorts the incentives of insurance companies. That is, guaranty fund insurance creates incentives for insurance companies, especially those on the brink of failure, to engage in too much risk. But what form might this moral hazard take? Where might one look for evidence of excessive risk? Does such evidence exist? These questions are the subject of this paper.

A major motivation for this study was a finding in previous research (Bohn and Hall

1995; Hall 1996) that the costs of resolving property and casualty (P&C) insurance company failures are surprisingly large. The total cost of resolving a P&C failure[1] is in the range of 100 to 120 percent of the company's pre-insolvency assets. This number is three to four times larger than analogous cost estimates of resolving depository institution failures.[2] Moreover, both the number of P&C insolvencies and the total costs of these insolvencies have risen in the last decade. (See figures 1 and 2). These large resolution costs suggest that the perverse incentives created by the guaranty fund system may be large. That is, moral hazard may be an explanation for these large costs.

The starting point for our analysis is the parallel between deposit insurance and the insurance provided by guaranty funds, both of which provide second-level insurance against insolvency.[3] The existence of (flat-rate) deposit insurance enables banks to engage in risky behavior without paying the appropriate price for their risk-taking.[4] Because depositors are insured against the risk of bank failure, they do not have incentives to monitor or discipline banks. Deposits represent a risk-free, and *adverse-selection free*, form of borrowing for banks. This enables even the riskiest of banks to borrow in capital markets. Indeed, by raising deposit

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[1] The total cost of resolving failures is equal to the costs of paying claims, plus the administrative costs of the liquidators and guaranty funds, minus recoveries from asset sales. Bohn and Hall (1995) found that the ratio of costs to pre-insolvency assets was equal to one. Using an updated dataset, Hall (1996) found this number to be about 1.2.

[2] James (1991), Bovenzie and Murton (1988) and Barth, Bartholomew and Bradley (1991) all find that the net cost of resolving bank failures is about one-third of pre-insolvency assets.

[3] There are two main differences between the deposit insurance and guaranty fund systems. First, unlike the bank insurance fund, the guaranty funds are not pre-funded (assessments are levied after insolvencies occur since there is no "fund"). Second, the guaranty funds are operated at the state rather than the federal level. The guaranty fund system is described in the next section.

[4] See Merton (1977) for an analytic proof.

rates by small amounts, banks were able attract large amount of deposits (made easier by an active brokered deposit market), which they then invested in risky loans.[5] The existence of deposit insurance (albeit in combination with other factors) is widely believed to be the main cause of the S&L debacle, which in the end cost taxpayers approximately $150 billion.

Although it has been much less studied by academics, the insurance provided by guaranty funds creates similarly perverse incentives.[6] Although insurance companies do not accept deposits, they do receive premiums. Since there is a lag between the time that premiums are received and the time that losses are paid out, attracting premiums is a way to borrow from policyholders. The key similarity between the two systems is that guaranty fund insurance diminishes the incentives of policyholders to monitor or discipline insurance companies, just as deposit insurance decreases the incentives for depositors to monitor banks. Thus, the guaranty fund system creates a peculiar way for insurance companies to borrow with little discipline from capital markets -- by writing premiums. Consistent with this possibility, we find evidence of excessive premium growth by P&C firms in the years before insolvency. Moreover, this premium growth is more pronounced in long-tail lines, which have a long lag between premium payments and policyholder claims, and therefore represent a more attractive way for insurance companies to borrow from policyholders.

This paper proceeds as follows. In the next section we provide some background on the guaranty fund system and describe the guaranty fund rules. In the third section we discuss the

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[5] For analysis of the S&L crisis and the perverse incentives created by deposit insurance, see Kane (1989).

[6] Cummins (1988) analyzes how guaranty funds affect risk-taking and how a risk-based premium structure can reduce the perverse incentives of guaranty funds.

theory of how the guaranty funds create perverse incentives for insurance companies, especially those on the brink of failure. In the fourth section, we describe our data and present evidence on the degree of pre-insolvency premium growth. In the fifth section, we disaggregate the premium growth into lines (e.g. personal property, corporate liability etc.) and show that much of the fast growth in premiums is in long tail lines. The sixth section contains some evidence on the relationship between state regulatory resources and premium growth. The final section summarizes and contains additional discussion and interpretation of the results.

2. Guaranty Fund Background and Description of Rules[7]

The guaranty fund system was a response to a federal initiative in the late 1960s to establish a guaranty system for insurance companies similar to the FDIC. Worried about a federal government "takeover" of insurance company regulation, the National Association of Insurance Commissioners (NAIC) proposed model legislation for the establishment of guaranty funds at the state level. By the early 1970s about three fourths of the states had adopted guaranty fund provisions that were closely based on the NAIC's Model Act. Most of the other states followed shortly thereafter.

Guaranty funds are generally non-profit associations of all companies licensed to write insurance within a state in lines covered by the guaranty fund. Insurance companies are required to be a part of the guaranty fund system in order to obtain a license. The board of each guaranty fund is composed of representatives from member firms and from the state insurance

[7] Much of the material in this section is derived from Bohn and Hall (1995), Duncan (1987) and Epton and Bixby (1976).

commissioner's office.

The state insurance departments, and not the guaranty funds, are responsible for the regulation and oversight of insurance companies, which includes the prevention and detection of insurance company insolvencies. Thus, involvement of the guaranty fund comes only after a company is declared to be insolvent, at which point the guaranty fund takes over the files of the failed insurer and pays the claims of policyholders.

In most cases, guaranty funds pay the full amount of policyholder claims in the same way that payment would be made by insurance companies. However, there are some caps and deductibles. In most states and in most lines, the caps on the funds' liability per claim are in the $300,000 to $500,000 range. Thus, for the vast majority of claims, especially in personal lines, the caps are rarely binding. In addition, the deductibles are very small, ranging from 0 to $200 per claim, with most funds having a deductible of $100. Note also that since guaranty funds pay only for the claims of the policyholders residing in their state, a failure of a multi-state insurance company involves action on the part of multiple guaranty funds.

Guaranty funds receive their money from the state insurance departments who are responsible for turning the money from the liquidation of assets to the guaranty funds. Hall (1996) has shown, however, that after paying all expenses related to the liquidation process, the state regulatory departments turn over an average of only 37 cents for each $1 of pre-insolvency assets. Thus, there is typically a large shortfall between the assets of the failed insurers and the obligations of the guaranty funds. The guaranty funds cover this shortfall by levying assessments against the solvent companies doing business in the state of the insolvent firms. The magnitude of assessments are directly proportional to a firm's share of direct premiums written

within a state in lines covered by the fund.[8] Thus, the size of assessments are not related to any measure of a companies insolvency risk. Guaranty funds also make assessments to cover their administrative, legal and other expenses.

Guaranty funds are not really funds since all but New York operate on a post-assessment basis. That is, guaranty funds maintain no reserves and only assess member insurance companies after an insolvency occurs.[9] In most states, the assessment amount is capped at two percent of premiums written per year, although some states maintain lower caps. In addition, most state regulations contain provisions that enable companies to partially offset assessments. For example, most states include the cost of assessments as a factor in determining premiums. In addition, many states allow insurers to recover a portion of their assessment with credits against their premium taxes, which shifts a portion of the costs of the insolvency to other state taxpayers.

3. Theory: Guaranty Fund Insurance and Moral Hazard

We begin by thinking about an insurance company that is insolvent or near-insolvent, but is still operating because it has not yet been "caught" by the regulators. The company is having trouble meeting its expenses because of mismanagement, higher than expected losses or some other circumstances. The management of the firm would like the firm to continue operations.

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[8] Guaranty funds are typically organized into separate accounts covering broad lines of insurance. The most common form of organization has three separate accounts -- worker's compensation, automobile and "all other" types of insurance. However, different states operate as few as one or as many as six accounts.

[9] New York State adopted guaranty fund legislation in 1947. Unlike other funds, New York's operates on a pre-assessment basis. The state maintains a fund of $150 to $200 million for the resolution of insurance failures. Firms writing insurance in the state are assessed whenever the fund balance falls below the lower bound.

That is, the firm needs to find some cash in order to continue operating (and to pay its employees and executives salaries, among other things). There are three main options available to such a firm:

Option 1: First, the company could raise outside financing. However, if the market requires the company to pay something even close to the appropriate risk premium, such financing would be extremely costly. In addition, such a company may not be able to raise any outside financing at all because of credit rationing.[10] Moreover, the current owners of such a firm are likely to have some knowledge of the firm's financial circumstances and are therefore reluctant to inject additional capital.

Option 2: Second, the company could sell off some of its assets to raise cash.[11] However, such an action may be very transparent to regulators since assets are fairly easy to measure and value (at least relative to liabilities) and such firms do not want to become noticed by the regulators. These firms have an incentive to behave in ways that increase their riskiness, but they must balance the benefits of engaging in risky behavior against the costs of increasing the probability of getting caught.

Option 3: Third, the company could attract more premiums, perhaps at prices below expected costs. The key insight is that selling premiums is similar to taking out a loan; premium payments represent an immediate inflow of cash and require (probabalistic) payments to be made at a later date. However, because the guaranty fund protects policyholders against insolvency risk, this type of "loan" (i.e. selling of premiums) is *adverse-selection free* form of finance. In order to borrow in this peculiar way, firms do not have to pay a large risk premium (because the guaranty funds protects the lenders, who in this case are the policyholders); nor do insurance companies need to worry about being credit-rationed out of the market when they borrow in this way. Perhaps equally important, it seems likely that option three would be less transparent to regulators

[10] See Stiglitz and Weiss (1981).

[11] In related work, one of us (Hall 1996) presents evidence that the assets of many failed companies are of poor quality, which is consistent with this possibility.

than option two (selling assets) since reserving (which amounts to deciding how large a liability is created by a particular policy) is an inexact science. That is, if a company needs cash and wants to game-the-system, it is likely to be easier to sell premiums and fudge its liabilities (by underestimating its future losses) than to sell off its assets, which are more easily measured by regulators.

To see why writing premiums is essentially borrowing money from policyholders consider the following equation:

$$(P_t - C_t)(1 + r_t) = E_t(L_{t+1})$$

where P is premiums, C is costs, r is the interest rate, and L is losses. The left hand side of the equation shows the revenues, net of costs required to operate the company, that a company gets during the year from writing premiums. Assuming for simplicity that all losses come in the subsequent period, the right hand side shows the expectation of next-period losses at time t+1. Competitive pressures, or more precisely a zero-profit condition, implies equality between the two in expectation. Note that when a firm writes a policy, it essentially borrows premiums (net of costs), which it then pays back to policyholders with interest.

This equation can be rewritten as:

$$P_t - C_t = \frac{E_t(L_{t+1})}{(1+r_t)}$$

The left hand side is equal to borrowing by the insurance company and the right hand side is equal to the net present value of (collective) repayment by policyholders. Without guaranty fund insurance an insolvent or near-insolvent company's repayments would be heavily discounted by

lenders (policyholders). In practice, this would mean that premiums prices would have to be lowered substantially. However, the existence of guaranty fund insurance removes the riskiness of "lending" to insurance companies enabling them to borrow at something close to the risk-free rate. This implies that because of guaranty fund insurance, highly risky insurance companies should be able to increase their premiums (and therefore cash flow) substantially with only small changes in premium prices.

As noted earlier, our story of how the guaranty fund system affects the incentives of insurance companies is very similar to models in the banking literature about the moral hazard problems associated with deposit insurance. Deposit insurance enables banks, even risky ones, to borrow from depositors at the risk-free rate. The incentive to borrow at the risk-free rate and use the funds to make high risk loans is especially attractive to poorly capitalized banks. Deposit insurance and limited liability combine to give the owners of the company what is a essentially a put option. For banks "at the money" or "out of the money" (insolvent or near-insolvent), increasing the volatility of their earnings increases the value of the bank.

That same principle applies to insurance companies. The incentive to borrow excessively from policyholders (attract premiums) and to use the money to make risky investments (perhaps by writing high-risk policies and/or under reserving) is especially strong for insurance companies that are already insolvent. Like the banks, they face "heads-I-win-tails--somebody-else-loses" incentives. Indeed, Kane (1989) has argued that the combination of poorly capitalized banks, deposit insurance and regulatory forbearance created what he termed S&L "zombies," so called because they sucked the life out of the live S&Ls by competing away their business with their aggressively risky behavior. This put the solvent S&Ls at risk, which in turn created more

zombies. Although we do not test for this in our empirical section, our analysis of the incentives created by the guaranty funds suggests at least the possibility that the guaranty fund system could create zombie insurance companies.

Finally, it should be noted that an extreme case of our story of how insurance companies can game the guaranty fund system is through a Ponzi scheme. In our previous story, insurance companies were gaming the system by maximizing the expected value of company, which involved high risks since the downside is essentially capped at zero. Under a Ponzi scheme, even a company that has no hope of ever becoming solvent can play. A company can increase premium growth while writing negative NPV policies. When the losses occur, the company can pay these claims by writing even more negative NPV policies. A company can then live to another day, with all the benefits to management that are associated with continued operations. As is well known, however, all Ponzi schemes eventually fail. We come back to this issue in the final section, where the results are discussed and interpreted.

4. Pre-Insolvency Premium Growth

One way to examining the moral hazard effects of guaranty fund insurance is to analyze how company financial condition correlates with risk-taking behavior. Ideally, one could analyze whether exogenously determined poor financial conditions were associated with excessive premium growth and other types of risk-taking behavior. However, in addition to the difficulty in finding a good instrument for financial condition, even using uninstrumented capital ratios as a measure of financial condition may be problematic. If our measure of capital is quite noisy (because companies that are gaming the system are also able to manipulate their book

value measure of capital), then a correlation between truly low capital rates and game playing may be hard to detect. Moreover, if in addition to those companies gaming the system, there are many responsible companies -- companies with negative shocks to their capital positions behave conservatively in the next period in order to regain their pre-shock financial status (a type of mean reversion) -- then it will be difficult to find evidence of gaming the system even if such evidence exists. Thus, although this approach (analyzing all companies in poor financial condition) has considerably merit, it also has potentially serious problems. We thus decided to take a different approach.

Our approach is to examine the pre-insolvency behavior of companies that become insolvent. While this approach does not represent a formal test proving causality between the guaranty fund and risk-taking (measured by excessive premium growth in this case), it does have an obvious advantage: if game-playing does exist and is serious enough to cause a significant number of insolvencies, then a pattern of excessive premium growth prior to insolvency should be detectable in a sample of failed companies.

4.1 Data Description

Our sample consists of property and casualty insurance firms that failed between 1987 and 1995. The initial set of failed firms was assembled from Best's Insurance Reports and the list of failures involving guaranty fund activity provided by the National Conference of Insurance Guaranty Funds (NCIGF). For each failed firm, we searched Best's and Lexis/Nexis for the date in which the firm was declared insolvent.[12] All of our analysis was done at the firm rather than

[12] The sequence of events involved in the takeover of a failed insurance company by the regulators is similar between states; however, terminology differs substantially. For our purposes, a court order declaring the

the group level. We define the year the firm was found to be insolvent as year t. Years prior to the year of failure are henceforth referred to as t-1, the calendar year prior to the year the firm was found insolvent, t-2, t-3 and so forth.

The set of firms was then merged with accounting information from the National Association of Insurance Commissioners's (NAIC) Annual Statement database. Firms that did not file annual statements in the three years prior to insolvency were omitted from the sample. Thus we have information concerning the financial position and business mix of each active firm for the three year period prior to assumption of management of the firm by regulators. There are 135 failed insurance companies in our sample.

4.2 Results

We now look for evidence that insurance companies are gaming the system by examining the pre-insolvency premium growth of firms that fail. Figure 3 plots the distribution of failed companies in terms of their premium growth, in the two years prior to insolvency. This represents premium growth from year t-3 to t-1 since t is defined to be the year of insolvency. Specifically, the figure plots the percentage of (failed) P&C companies that had premium growth of zero to ten percent, ten to twenty percent and so on in the two year period prior to insolvency.[13] The striking feature of the distribution is the extremely high number of companies in the "high premium growth" tail, both as a proportion of the total and relative to the proportion

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insurer insolvent or the placement of the firm in rehabilitation or conservation are equivalent since all three events entail the regulators assuming primary responsibility for the management of the firm.

[13] A very similar pattern emerged when we looked at premium growth in the one year prior to failure (t-2 to t-1), but we focus on growth rates in the two years prior to insolvency to decrease the possibility that idiosyncratic factors in one year generate noisy growth rates.

of companies in the center of the distribution.[14] For example, more than 35 percent of failed companies had total premium growth of more than 50 percent (in real terms) in the two years prior to failure.

In order to determine whether the large percentage of high growth firms in the failed sample is unusual, we compared our sample with a matched sample -- on the basis of asset size and year failed. In order to reduce noise, we picked four matches (the two nearest larger and the two nearest smaller) for each of our 135 failed firms. The two-year premium growth rates are plotted in Figure 4. While the matched sample also contains a reasonably large number of high growth companies, presumably because these firms are relatively small by industry standards, the percentage of high growth rate firms is less than half of the percentage of high growth companies in the failed sample. The evidence suggests that there is an unusually large percentage of firms that grew quickly prior to failure. This is consistent with the view that the incentives created by the guaranty funds is leading to moral-hazard induced fast premium growth.

5. Premium Growth and Line Composition

In the previous section, we showed that a disproportionate number of failed insurance companies had unusually high premium growth prior to failure. In this section, we disaggregate the premiums into line composition to determine which lines were associated with this growth. The key question is this: if insurance companies are gaming the system, which lines are they likely to increase the most?

[14] Note in their Insolvency Report (1991) A.M. Best also reports high premium growth for P&C insurance companies that subsequently failed.

5.1 Long-Tail Lines

There are several reasons to suspect that insurance companies that seek to game the system are likely to use premium growth in long tail lines as their vehicle for doing so. First, it is harder to precisely estimate the future losses in long tail lines. Liability claims are less predictable than, for example, physical damage from automobile accidents. While uncertainty about future losses in normally an unattractive feature to insurance companies, it is a desirable characteristic to a company that wishes to game the system by under reserving. Second, the simple fact that long-tail lines create long-term borrowing opportunities for insurance company gamers makes premium growth in these lines attractive. The one thing that insurance companies that desire to game the system want is more time. Increasing premium growth in long-tail lines enables companies to buy that time.

5.2 Results

In order to test this possibility, we divided our failed sample into fast growth (real premium growth of over 50 percent between years t-3 and t-1) companies and slow growth companies. We then looked at how the fraction of premiums in long tail lines changed for the fast growth firms relative to the slow growth firms in a variety of lines of business. (The precise definitions of how we categorized the lines of business appears in Appendix A.) The results are in Table 1. The first three columns show the results for the 47 fast growth companies. The fraction of premiums written in the specific line is shown for t-3, then t-1, followed by the change between the two years. The results are then repeated for the 87 slow growth firms in the next three columns.

The results indicate that fast-growth companies increased their fraction of premiums in

long-tail lines from an average of about 31 percent to almost 70 percent. This represents a 39 percentage point increase in the share of business in long-tail lines. By contrast, the fraction of premiums in long tail lines for the slow growth firms was essentially unchanged, falling by about three percentage points. Moreover, both a t-test and a Wilcoxon rank sum test, which are shown in the bottom portion of Table 1, confirm that the differential change in the share between fast growth firms (38.8 percent) and slow growth firms (-2.7 percent) is statistically significant. The strong relative movement into long-tail lines for the potential gamers (firms with fast premium growth) is therefore consistent with our theory that increasing long-tail lines is a good way to game the system.

In order to determine more precisely which lines fast-growers are moving into, we adopt narrower definitions of the insurer's lines of business. The results are shown in the next six rows. First, the four combinations of personal/corporate and property/liability are considered. Then, worker's compensation and automobile are considered. Two results stand out. First, while there is some change in the lines of the fast growth firms, none of the categories of lines change significantly for the slow growth firms. Unlike the fast-growth companies, these slow-growth companies march forward toward insolvency with little aggregate change in the composition of their business.

Second, the primary reason for the increase in the fraction of premiums in long tail lines for the fast growth firms is the increase in personal, not corporate, liability lines, as indicated by the aggregate 25 percentage point increase in the share in personal liablility lines. There is only a 10 percent increase in the share of corporate liability lines, and this change is not statistically different from the near-zero (-1.6 percent) change in the corporate liability share for the slow

growth firms.

There are at least two reasons why gaming firms may choose to increase growth in personal liability premiums rather than in corporate liability premiums. First, losses in corporate liability lines tend to be larger, and therefore are more likely to exceed the guaranty fund caps. Thus, corporate buyers of liability insurance may care about the solvency of insurers in a way that individual buyers do not. Second, corporate insurance purchasers are likely to be better informed about the rules and the financial condition of the insurer than individual purchasers of liability insurance. That is, the relative inability of individuals who purchase liability insurance (which consists primarily of auto liability insurance) to learn about and understand the guaranty fund rules may make growth in this category ideal for companies that want to game the guaranty fund system. The large (20 percent) increase in the fraction of premiums in auto for the fast growth firms, shown in the last row, is consistent with this story.

In order to test the robustness of these basis results, we compared the fast growth (failed) companies with a matched sample of non-failed, fast growth (again, greater than 50 percent growth) companies. Each high-growth failed firm was matched by size and year with four high-growth healthy firms. The results, shown in Table 2 and using the same procedure as in Table 1, tell the same basic story. All of the comparisons are basically the same, which is not surprising given that, like the slow-growth failed firms, the fast-growth non-failed firms show little change in any of the lines of business. The fact that potential gamers (fast-growth failed firms) increase their fraction of premiums in long-tail lines (especially personal liability) while a similar set of fast growing non-gaming firms does not strengthens the case that premium line changes of the

gamers is unusual.[15]

As a final test, we compared the slow growth failures with a matched set (again, matched by size and year) of slow-growth non-failures. Neither group showed any significant change in their lines of business,[16] so it is not surprising that the statistical tests show no statistical differences between (the changes in) the two groups. Both the failed and the non-failed (slow growth) companies seem to be marching forward with little change in their mixes, the former into insolvency and the latter into relative prosperity.

Finally, we used regression analysis to determine if the relative changes in business composition hold controlling for various factors. We combine the samples of failed and matched firms from tables 1 and 3 to determine whether the potential gamers (fast-growth, failed firms) changed their business composition relative to non-gamers. The change in the share of a firms's line of business was regressed on a constant, FAST (equals one if a fast-growth firm), FAILED (equals one if failed) and FASTFAIL, the interaction of FAST and FAILED. FASTFAIL is the coefficient of interest since this coefficient indicates how gamers change their business composition relative to non-gamers. We also included additional control variables, which are defined in Appendix B. An indicator for MUTUAL was included. ASSETS was included as a proxy for size and LEVER, the ratio of liabilities to assets, was included to capture the capital position of the firm.

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[15] If companies are gaming the system with fast premium growth, then unless they are all Ponzi schemes, some companies should be expected to succeed (i.e. to gamble and remain solvent). Our ability to find a matched sample of fast-growing non-failed firms is consistent with this story. That is, our sample of fast-growth non-failures may include some "gamers" that succeed.

[16] It was already established in Table 1 that the slow-growth failed companies did not change their line mix significantly.

The results are shown in Tables 4A and 4B and tell a similar story. In the specification with the change in the fraction of long-tail lines as the dependent variable, the coefficient on the interaction term FASTFAIL is positive and statistically significant, indicating a significant increase (about 39 percentage points) in the fraction of long-tail lines for potential gamers. Moreover, as before, this increase is in personal liability and auto lines, as indicated by the positive and significant coefficients on FASTFAIL in those two specifications. Conversely, when corporate liability is the dependent variable, the coefficient on FASTFAIL is positive but the magnitude is small (0.08) and not close to being statistically significant. In sum, the results of Table 4A and 4B corroborate the findings of the earlier tables.

6. Regulatory Resources and Excessive Premium Growth

The final issue that we address is whether there is any evidence that a higher level regulatory resources in a state is effective in reducing the amount of excessive premium growth. To the extent that companies are gaming the system in the way we have described, one would expect that increased regulatory scrutiny, which is likely to be positively correlated with the state's regulatory resources, would reduce the degree of game playing.

In order to test this idea, we employ a logit model with high growth as the dependent variable and various measures of regulatory resources as the explanatory variables. As in the earlier sections, we define high growth firms as those that increase premium growth by 50 percent or more between years t-3 and t-1. We also include the same control variables as in Table 4.

The measures of regulatory resources include: BUDCO1 and BUDCO2 -- the state

regulatory budget divided by the number of insurance companies in the state (determined two ways; see Appendix B for precise definitions), and EXAMCO1 and EXAMCO2 -- the number of examiners in the state's regulatory office divided by the number of companies (again, defined two ways). Greater regulatory resources may limit the ability of insurers to game the system. An increased number of examiners may make it more likely that regulators will be able to detect unusual activity by an insurer. Regulators can then either take action to curtail the activities of a firm or petition the court to declare the insurer insolvent and placed under state supervision. In most cases, the entity filing the petition of insolvency is the office of the insurance commissioner in an insurer's state of domicile. Thus, the resources available to the commissioner in the state of domicile should have some effect on the ability of an insurer to game the guaranty fund.

The problem, of course, is that none of the measures of regulatory resources are exogenous. In particular, one might expect that an increase in insurance company risk-taking might lead to a greater need for regulatory resources. This biases the results against finding that more regulatory resources lead to lower game playing. Nevertheless, we believe that this exercise is worth doing to see if there is evidence of a regulatory effect in spite of this bias.

The results with the failed sample are shown in Table 5A. In all four cases, the coefficient on regulatory resources is negative, indicating that more resources are associated with a decreased probability that the company is a high-growth gamer. Moreover, two of the coefficients are significant at the 5 percent confidence level and one is significant at the 10 percent level. In terms of the implied magnitude of the effect, the coefficients imply that a 10 percent increase in the amount of budgetary resources is associated with approximately a 0.9 percent decrease in the probability that the firm is high growth (Model 1). Using Model 3, the

results indicate that a 10 percent increase in the number of examiners is associated with a 2 percent decrease in the probability that the firm is high growth. Thus, the magnitudes of the coefficients imply a modest, but not insignificant, effect.

The same tests are then repeated for the non-failed sample. These results are shown in Table 5B. The coefficients on the budgetary variables are again negative, but, as expected, the effects are smaller in magnitude.[17] Moreover, none are statistically significant. These results should be interpreted with the caveat that they are weak and are biased in the direction of not finding a relationship between regulatory resources and game playing. Nevertheless, taken together, the result suggest that more regulatory resources may be effective in curbing excessive premium growth by firms attempting to game the guaranty fund system.

7. Summary and Conclusion

The S&L and commercial banking crisis of the late 1980s and 1990s led to a large literature on the moral hazard effects of deposit insurance. Research on the moral hazard of the guaranty fund system -- the moral hazard of insuring the insurers -- pales in comparison. This paper is an attempt to fill that gap.

We first explain the mechanism through which the guaranty fund system may create moral hazard and then describe how this moral hazard might manifest itself in terms of insurance company behavior. We start with a parallel between bank deposit insurance and guaranty fund insurance, both of which provide second-level insurance against the failure of the relevant

[17] The effect of a change in regulatory resources on the likelihood of a solvent firm falling into the fast growth category is about one-fifth as large as it is for the corresponding model using failed firms.

financial institution. Just as deposit insurance enables banks to borrow at the risk-free rate from insured depositors, guaranty fund insurance enables insurance companies to borrow at (approximately) the risk-free rate from policyholders. The key insight is that premium payments are similar to borrowed funds since there is a lag, which is particularly long in long-tail lines, between premium payments and policyholder claims. Thus, we argue that one way insurance companies can game the guaranty fund system is through a peculiar type of borrowing -- fast premium growth.

The patterns that emerge in the data are consistent with this story. More than one-third of insolvent P&C insurance companies had very high premium growth in the two years prior to failure. And, as might be expected if companies are gaming the system in the way we have described, this premium growth was more pronounced in long-tail lines than in short-tail lines. Moreover, the increase in long-tail lines was driven by personal liability lines -- where the guaranty fund caps are less likely to be binding -- rather than corporate liability lines. Finally, it was shown that excessive premium growth was less pronounced in states that had greater regulatory resources. Taken together, the results are strikingly consistent with the moral hazard story we have described.

Despite this, it is possible that the risky insurance company behavior we have documented would have occurred even without the guaranty fund system. For example, it may be the case that insurance companies take advantage of buyers who are relatively uninformed about the financial condition of the firm. Thus, insurance companies may be able to game the system by increasing premium growth to these "credit insensitive" buyers. Indeed, this story is consistent with the evidence that premium growth was more pronounced in personal lines than in

corporate lines; it seems likely that individuals are less informed than corporations about the financial condition of insurance companies.

Thus, although our analysis reveals some striking patterns consistent with guaranty fund induced moral hazard, it is clear that additional research is needed to establish the extent to which the risky behavior documented in this paper is caused by the existence of the guaranty fund system. One potential direction for future research is to make use of the state variation in guaranty fund caps. Although this variation is not large, such an approach has the potential to provide a purer test of the proposition that guaranty fund insurance creates moral hazard. In addition, if good insurance company data can be found for the 1960s, another possibility is to compare insurance company behavior before and after the introduction of the guaranty fund system. Finally, as discussed in section 4, yet another approach is to start with the set of all insurance companies and then analyze how firm financial conditions influence firm risk taking.

Additional research is also needed to increase our understanding of the nature and degree of insurance company risk taking. This study has considered only one type of moral hazard -- excessive premium growth. Our understanding of the incentive effects of insurance company regulation would be greatly increased by an investigation of other ways in which insurance companies engage in excessively risky behavior.

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Figure 1

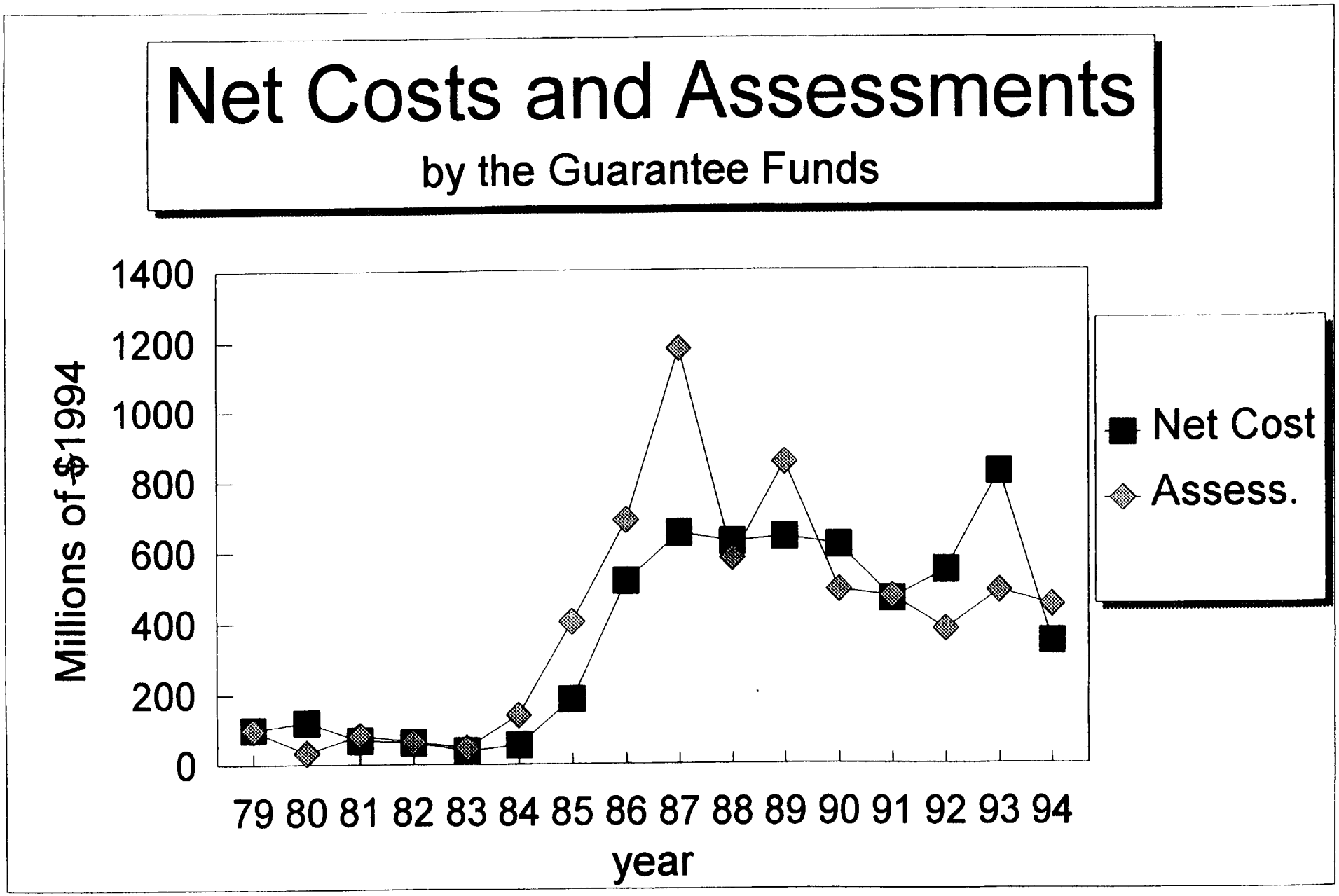
Net Costs and Assessments
by the Guarantee Funds
Millions of $1994
1400
1200
1000
800
600
400
200
0
79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94
year
Net Cost
Assess.

Figure 2

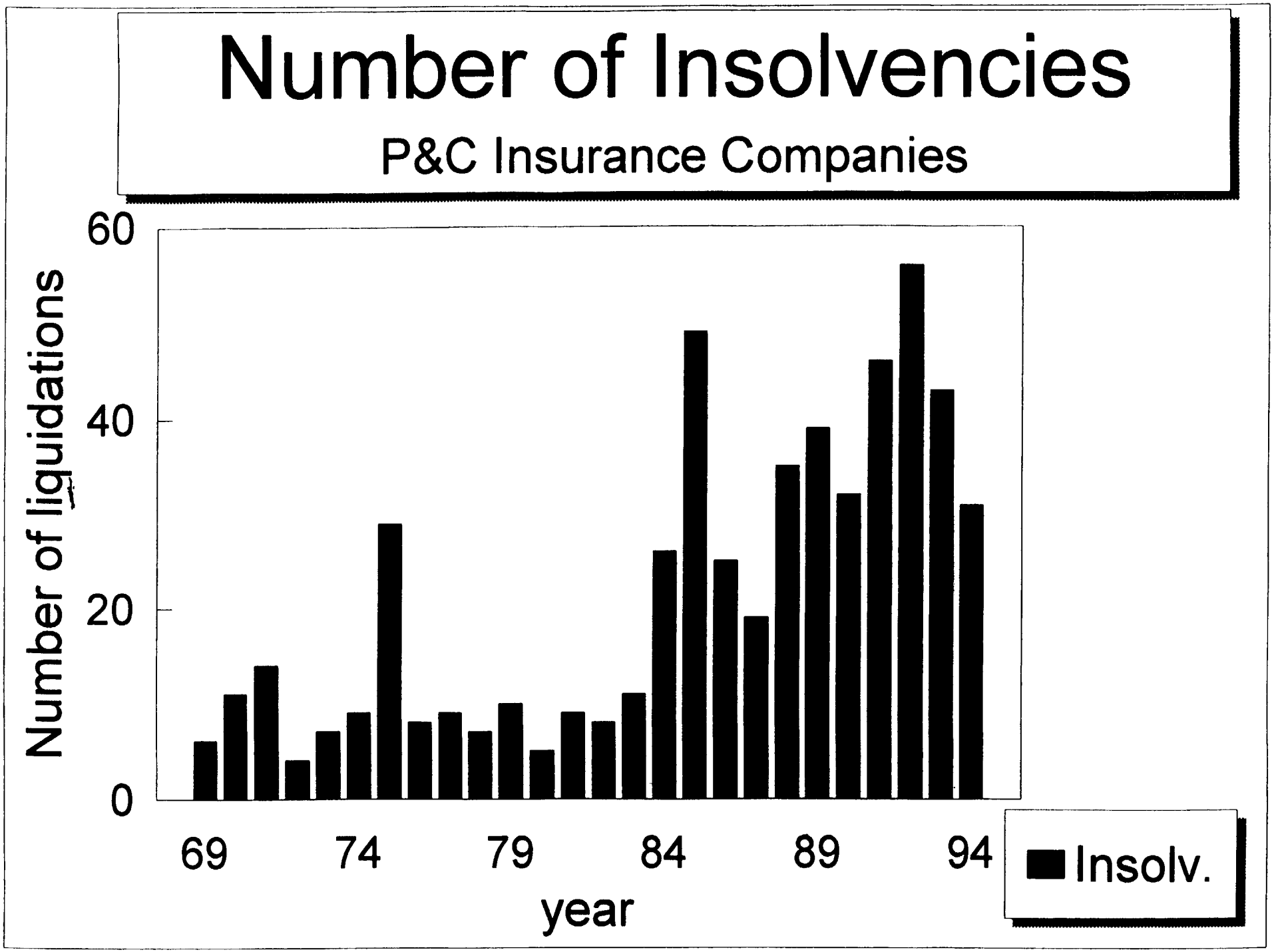
Number of Insolvencies
P&C Insurance Companies
Number of liquidations
60
40
20
0
69
74
79
84
89
94
year
Insolv.

Figure 3

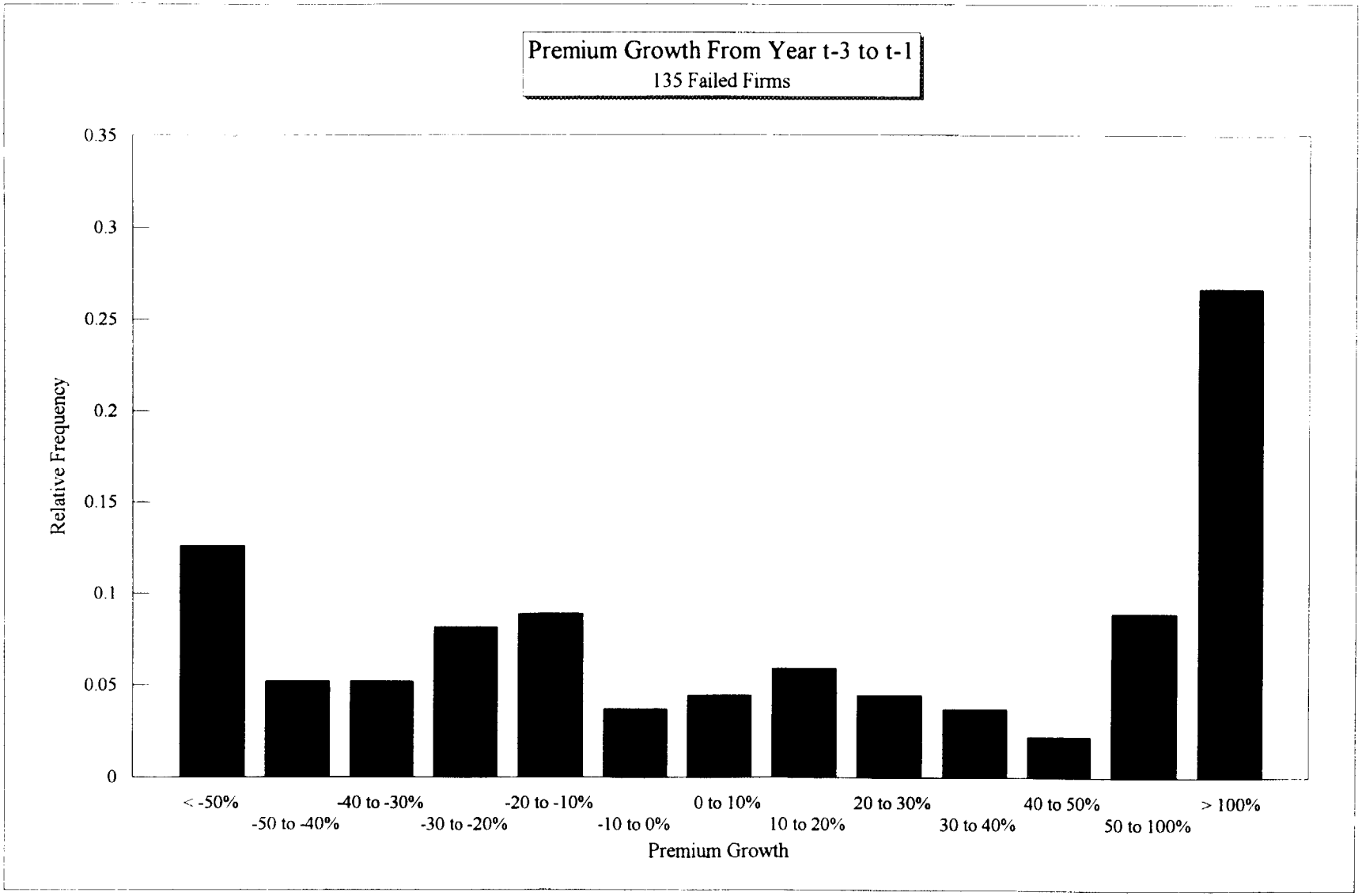
Premium Growth From Year t-3 to t-1
135 Failed Firms
Relative Frequency
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
< -50%
-50 to -40%
-40 to -30%
-30 to -20%
-20 to -10%
-10 to 0%
0 to 10%
10 to 20%
20 to 30%
30 to 40%
40 to 50%
50 to 100%
> 100%
Premium Growth

Figure 4

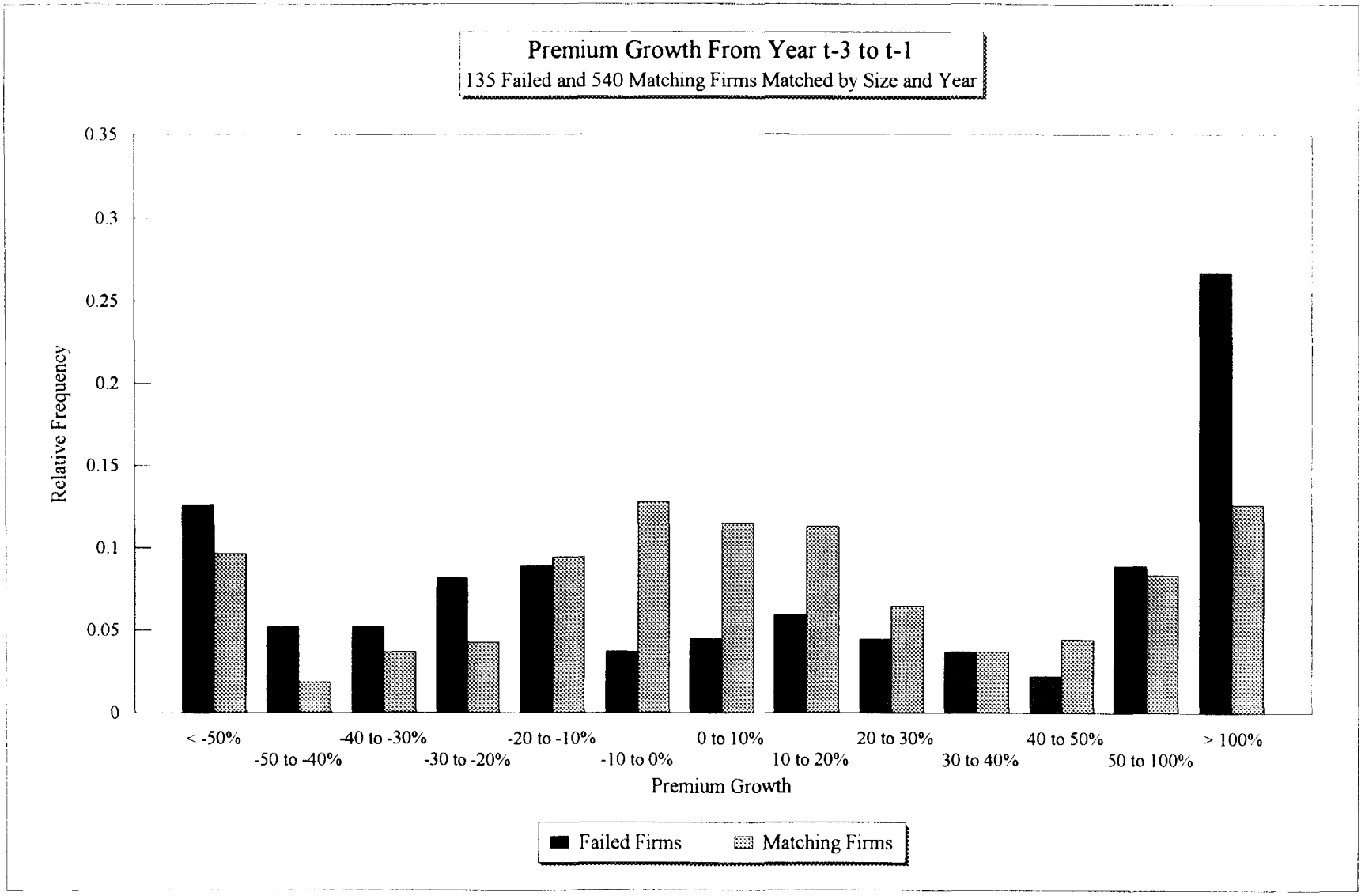
Premium Growth From Year t-3 to t-1
135 Failed and 540 Matching Firms Matched by Size and Year
Relative Frequency
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
< -50%
-50 to -40%
-40 to -30%
-30 to -20%
-20 to -10%
-10 to 0%
0 to 10%
10 to 20%
20 to 30%
30 to 40%
40 to 50%
50 to 100%
> 100%
Premium Growth
Failed Firms
Matching Firms

Table 1
Failed Firms Partitioned by Growth Rates[1]

Line of Business	Fast Mean T-3	Fast Mean T-1	Change In Fast	Slow Mean T-3	Slow Mean T-1	Change In Slow
% in Long-Tail Lines	30.98	69.79	+38.81	62.56	59.84	-2.73
% in Pers. Property	28.25	21.14	-7.10	18.69	16.78	-1.91
% in Pers. Liability	14.53	40.00	+25.47	28.21	24.94	-3.27
% in Corp. Property	41.51	12.79	-28.71	22.78	29.53	6.74
% in Corp. Liability	15.70	26.05	+10.35	30.31	28.74	-1.56
% in Work. Comp.	13.61	9.74	-3.88	13.44	12.85	-0.59
% in Automobile	38.31	58.43	+20.12	40.38	36.01	-4.36

Statistical Tests of Changes

Line of Business	Change In Fast	Change In Slow	T-Test (p-value)	Wilcoxon (p-value)
% in Long Tail Lines	+38.81	-2.73	.0263	.0396
% in Personal Property	-7.10	-1.91	.5089	.6031
% in Personal Liability	+25.47	-3.27	.0111	.0041
% in Corporate Property	-28.71	6.74	.0370	.1691
% in Corporate Liability	+10.35	-1.56	.3962	.7364
% in Worker's Comp	-3.88	-0.59	.2404	.9762
% in Automobile	+20.12	-4.36	.0069	.0193

1. Includes 47 high growth and 87 low growth failed firms.

Table 2
High Growth Firms Partitioned by Failure[1]

Line of Business	Failed Mean T-3	Failed Mean T-1	Change in Failed	Matched Mean T-3	Matched Mean T-1	Change in Matched
% in Long Tail Lines	30.98	69.79	+38.81	45.21	48.40	+3.19
% in Personal Property	28.25	21.14	-7.10	26.42	24.64	-1.79
% in Personal Liability	14.53	40.00	+25.47	17.86	19.21	+1.35
% in Corporate Property	41.51	12.79	-28.71	35.11	33.41	-1.71
% in Corporate Liability	15.70	26.05	+10.35	20.59	22.74	+2.15
% in Worker's Comp	13.61	9.74	-3.88	4.21	6.14	+1.93
% in Automobile	38.31	58.43	+20.12	34.69	35.15	+0.46

Statistical Tests of Changes

Line of Business	Change in Failed	Change in Matched	T-test (p-value)	Wilcoxon (p-value)
% in Long Tail Lines	+38.81	+3.19	.0483	.0406
% in Personal Property	-7.10	-1.79	.4952	.2984
% in Personal Liability	+25.47	+1.35	.0160	.0002
% in Corporate Property	-28.71	-1.71	.0909	.1042
% in Corporate Liability	+10.35	+2.15	.5551	.0231
% in Worker's Comp	-3.88	+1.93	.0338	.0514
% in Automobile	+20.12	+0.46	.0036	.0009

1. Includes 47 high growth failed firms and 187 high growth solvent firms matched by the calendar year of the annual statement and assets in year t-2.

Table 3
Slow Growth Firms Partitioned by Failure[1]

Line of Business	Failed Mean T-3	Failed Mean T-1	Change in Failed	Matched Mean T-3	Matched Mean T-1	Change in Matched
% in Long Tail Lines	62.56	59.84	-2.73	44.15	44.90	+0.75
% in Personal Property	18.69	16.78	-1.91	30.66	29.76	-0.90
% in Personal Liability	28.21	24.94	-3.27	15.42	16.61	+1.19
% in Corporate Property	22.78	29.53	6.74	31.89	32.63	+0.72
% in Corporate Liability	30.31	28.74	-1.56	22.03	20.98	-1.04
% in Worker's Comp	13.44	12.85	-0.59	6.00	6.06	+0.06
% in Automobile	40.38	36.01	-4.36	29.21	30.02	+0.81

Statistical Tests of Changes

Line of Business	Change in Failed	Change in Matched	T-Test (p-value)	Wilcoxon (p-value)
Long Tail Lines	-2.73	+0.75	.4816	.8847
Personal Property	-1.91	-0.90	.5533	.5380
Personal Liability	-3.27	+1.19	.4149	.5453
Corporate Property	6.74	+0.72	.3028	.8102
Corporate Liability	-1.56	-1.04	.8227	.1136
Worker's Comp	-0.59	+0.06	.6106	.1098
Automobile	-4.36	+0.81	.4177	.2793

1. Includes 87 slow growth failed firms and 350 matching solvent firms matched by the calendar year of the annual statement and assets in year t-2.

Table 4A
Change in Business Composition Prior to Failure

Dependent variable is the change in the share of a firm's business in each line between years t-3 and t-1 where t=0 is the year of insolvency. Sample contains 134 failed and 532 matched solvent firms. All independent variables are defined in Appendix B. Heteroscedasticity consistent standard errors in parentheses.

Variable	Long Tail Lines	Personal Property	Personal Liability
INTERCEPT	.0047 (.0256)	-.0194 (.0195)	.0362** (.0166)
FAST	.0282* (.0165)	-.0073 (.0134)	-.0057 (.0118)
FAILED	-.0313 (.0473)	-.0145 (.0190)	-.0039 (.0511)
FASTFAIL	.3899** (.1801)	-.0436 (.0781)	.2876*** (.1094)
MUTUAL	.0123 (.0153)	-.0036 (.0142)	-.0030 (.0104)
ASSETS	.0737* (.0439)	-.0305 (.0279)	-.0257 (.0318)
LEVER	-.0088 (.0503)	.0257 (.0440)	-.0438 (.0303)
Adj R^2	.0542	-.001	.0497

Significant at the *10%, **5%, and ***1% level

Table 4B
Change in Business Composition Prior to Failure (continued)

Dependent variable is the change in the share of a firm's business in each line between years t-3 and t-1 where t=0 is the year of insolvency. Sample contains 134 failed and 532 matched solvent firms. All independent variables are defined in Appendix B. Heteroscedasticity consistent standard errors in parentheses.

Variable	Commercial Property	Commercial Liability	Worker's Compensation	Automobile
INTERCEPT	.0203 (.0240)	-.0372* (.0189)	-.0010 (.0108)	.0370** (.0179)
FAST	-.0297* (.0159)	.0428*** (.0151)	.0203* (.0110)	-.0125 (.0170)
FAILED	.0600 (.0555)	-.0068 (.0230)	-.0066 (.0136)	-.0450 (.0596)
FASTFAIL	-.3280** (.1648)	.0838 (.1379)	-.0515* (.0289)	.2505*** (.0895)
MUTUAL	-.0141 (.0149)	.0207* (.0121)	-.0020 (.0042)	-.0046 (.0177)
ASSETS	-.0142 (.0366)	.0706 (.1182)	.0539 (.0472)	-.0390 (.0398)
LEVER	-.0162 (.0510)	.0342 (.0323)	.0011 (.0200)	-.0508 (.0354)
Adj R^2	.0374	.0141	.0153	.0325

Significant at the *10%, **5%, and ***1% level

Table 5A
Logit Model of the Likelihood of Fast Premium Growth for Failed P&C Insurers

Fast premium growth is defined as a 50 percent or greater real increase in direct premium writings between t-3 and t-1 where t=0 is the year of insolvency. Dependent variable=1 if company exhibited high growth in direct premium writings, 0 otherwise. N=132 with 47 high growth firms and 85 low growth firms in each model. Independent variables are defined in appendix B. Asymptotic standard errors are in parentheses. Excludes firms domiciled in Puerto Rico and US Territories.

	Model 1	Model 2	Model 3	Model 4
INTERCEPT	1.0048 (.5417)	1.0262* (.5686)	1.5290** (.6407)	1.4910** (.7285)
MUTUAL	-1.2641 (.8476)	-1.2363 (.8529)	-1.1423 (.8470)	-1.2244 (.8601)
ASSETS	-24.5389** (11.9010)	-23.8942** (11.8983)	-20.8848* (11.4587)	-19.0954* (11.0735)
LEVER	-.9775 (.8233)	-1.0433 (.8228)	-1.0532 (.8276)	-1.1231 (.8156)
BUDCO1	-5.7852** (2.7468)			
BUDCO2		-2.9895* (1.7026)		
EXAMCO1			-6.0972** (2.7409)	
EXAMCO2				-2.5846 (1.7036)
Psuedo R^2	.1169	.0951	.1288	.1050

Significant at the *10%, **5% and *** 1% level.

Table 5B
Logit Model of the Likelihood of Fast Premium Growth for the Matched Set of Solvent P&C Insurers

Fast growth is defined as a 50% or greater real increase in direct premium writings between t-3 and t-1 where t=0 is the year of insolvency. Dependent variable =1 if company exhibited high growth in direct premium writings, 0 otherwise. N=526 with 186 high growth firms and 340 low growth firms in each model. Independent variables are defined in appendix B. Asymptotic standard errors are in parentheses. Excludes firms domiciled in Puerto Rico and US Territories.

	Model 1	Model 2	Model 3	Model 4
INTERCEPT	.5620*** (.2083)	.5270** (.2197)	.5893*** (.2148)	.5513** (.2255)
MUTUAL	-1.3015*** (.2739)	-1.2939*** (.2747)	-1.2952*** (.2734)	-1.2956*** (.2740)
ASSETS	-19.8502*** (5.4194)	-19.7396*** (5.4325)	-19.6684*** (5.4016)	-19.7042*** (5.4087)
LEVER	-1.0957*** (.3818)	-1.1231*** (.3813)	1.1020*** (.3813)	-1.1245*** (.3791)
BUDCO1	-1.2001 (1.5740)			
BUDCO2		-.2637 (.9450)		
EXAMCO1			-.5244 (.5619)	
EXAMCO2				-.1340 (.2944)
Psuedo R^2	.1276	.1269	.1281	.1271

Significant at the *10%, **5% and *** 1% level.

Appendix A: Business Mix Definitions

Personal Property:	Farmowners and Homeowners Multiple Peril, Auto Physical Damage
Personal Liability:	Auto Liability
Corporate Property:	Commercil Multiple Peril, Fire, Allied Lines, Earthquake, Aircraft, Inland and Ocean Marine, Financial Guarantee Lines
Corporate Liability:	Workers Compensation, Medical Malpractice, Products and Other Liability, Accident and Health Lines.
Long Tail Lines:	Personal and Corporate Liability Lines and Financial Guarantee Lines
Automobile:	Auto Liability and Auto Physical Damage.
Worker's Comp:	Worker's Compenstaion.

Appendix B: Data Definitions

FAST	FAST=1 if the direct premiums written by the insurer increased by more than 50% in real terms in the two years prior to insolvency, i.e. between years t-3 and t-1.
FASTFAIL	FASTFAIL=1 if FAST=1 and the firm became insolvent in year t, 0 otherwise.
MUTUAL	MUTUAL =1 if the firm has a mutual form of ownership, 0 otherwise.
ASSETS	The assets of the firm in billions of 1994 dollars on the annual statement filed on December 31st of year t-3 where year t is the year of insolvency.
LEVER	The ratio of liabilities to assets of the firm on December 31st of year t-3 where t is the year the firm was found insolvent.
BUDCO1	The budget of the insurance commission in the state of domicile divided by the number of firms domiciled in that state. Insurance Commission budget is for the year 1990 and the number of firms domiciled in the state is taken from *Best's Solvency Study - Property/Casualty.*
EXAMCO1	The number of examiners employed by the insurance commission in the state of domicile divided by the number of firms domiciled in that state. The number of examiners is for the year 1990 and the number of firms domiciled in the state is taken from *Best's Solvency Study - Property/Casualty.*
BUDCO2	Same as BUDCO1 with the exception that the number of firms domiciled in the state was obtained from the 1990 demographics file of the NAIC Annual Statement Database.
EXAMCO2	Same as EXAMCO1 with the exception that the number of firms domiciled in the state was obtained from the 1990 demographics file of the NAIC Annual Statement Database.