Bankruptcy in the Core and Periphery of Financial Groups: The Case of the Property-Casualty Insurance Industry

by

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Abstract

This paper studies the survival outcomes experienced over a 14-year period by a comprehensive sample of group-affiliated U.S. property-casualty insurance companies from 1994. While it is generally assumed that affiliate support enhances the financial strength of a subsidiary within a group, this paper finds that claimants on non-core affiliates (i.e., those with *less* reinsurance support from and with *looser* ties to the flagship company) fared better, on average, than claimants on core and flagship subsidiaries.

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I. Introduction

Businesses in many industries are organized as groups of legally distinct companies affiliated through common ownership and similar relationships. It is well known that utilization of subsidiary corporate structures can yield a variety of benefits, with one being that limited liability shields healthy members of the group from financial difficulty at a particular subsidiary (see, e.g., Douglas and Shanks (1929)). The presence of these shields prompts rating agencies to begin risk assessment at a standalone level, before considering the extent and nature of affiliate support commitments.

Affiliate support is generally viewed favorably, especially within financially strong groups. A subsidiary core to a group's strategy is usually judged to be more likely to receive support than an ancillary subsidiary in the event of trouble. Conversely, a subsidiary judged to be relatively unimportant to a group's strategy would presumably be expendable---with the subsidiary's claimants subject to expropriation by controlling affiliates. For this reason, insolvency risk is generally perceived to be greater for subsidiaries that do not enjoy the explicit support of the parent organization, and even greater for those that may also lack implicit support---with the rating of the parent usually (though not always) serving as a ceiling on the rating of the subsidiary.[1]

However, recent experience with certain distressed investment banks and insurance companies in the aftermath of the Panic of 2007 reveal that the fog of distress can produce strange and unanticipated outcomes within corporate groups, with the consequence that claimant recoveries may ultimately vary substantially according to which subsidiary within the group had issued the claims. While such variation is not in itself surprising, the variation in some circumstances ran counter to what most would have predicted *ex ante*. Specifically, in some cases, peripheral subsidiaries that were not tied strongly to affiliates proved to be insulated from problems at other subsidiaries---and thus enjoyed better outcomes, although *ex ante* one might have doubted their relative safety due to the absence of compelling reasons for support from affiliates in the event of their own distress.

This paper attempts to ascertain whether or not the pattern described above is systematic by tracking the solvency performance of a sample of group-affiliated property-casualty insurance companies from 1993 to 2008. The insurance industry is an ideal one for this study due to the presence of easily accessible data on the nature of intra-group financial commitments.

The analysis focuses on groups that disintegrated in the sense that some affiliates failed while others survived, with the aim of understanding how the group structure---in terms of ownership and risk-sharing agreements---ended up favoring some affiliates over others. It finds that affiliates that are less integrated into the parent organization in terms of risk sharing agreements and ownership relations tend to have lower insolvency

[1] A related issue concerns the extent to which a country's sovereign rating serves as a ceiling on the ratings of the country's private firms. While the "sovereign ceiling" usually prevails, there are some cases where firms are granted rating higher than those of their government. See, e.g., Durbin and Ng (2005).

probabilities. More specifically, small subsidiaries and affiliates that are controlled but not owned (such as county mutuals and Lloyds' organizations), especially those that are free of pooling or reinsurance arrangements within the group, tend to survive. Flagship companies tend to be at higher risk.

These findings run counter to the conventional wisdom about insurance groups, where the more common fear is that large flagships will sever ties to a troubled subsidiary. In fact, it is not uncommon for the ties to be cut, but the context is more often one where the flagship is struggling, and, for a variety of reasons, a peripheral subsidiary is set free.

A possible explanation for this finding is that reputational and regulatory pressures work to prevent insurance groups from allowing affiliate failures. Given this state of affairs, the main insolvency risk stems from financial trouble in the core of the group: Non-core affiliates have a better chance of surviving such distress, as they are shielded from problems at the parent organization and can more easily be sold off to raise cash.

The rest of this paper is organized as follows. Section II offers a motivating example along with related literature and institutional background. Section III discusses the data and construction of variables. Section IV reports the regression results. Section V concludes.

II. Motivation and Background

Example: Crisis at Ambac

A motivating case is offered by the recent troubles of Ambac Financial Group. Ambac Assurance Corporation was the flagship insurance company, owned directly by the publicly traded holding company (Ambac Financial), and held more than $10 billion in assets. Connie Lee Insurance Company, owned by Ambac Assurance through an intermediate holding company, held about $170 million in assets.

Ambac's primary business was the guaranteeing of municipal and structured finance obligations. Connie Lee had guaranteed the debt of colleges and hospital infrastructure projects prior to being acquired by Ambac in 1997, after which it ceased writing business on a direct basis. Both companies were rated AAA by S&P in 2006, with Connie Lee's rating flowing from reinsurance support provided by Ambac Assurance Corporation.

By 2008, Ambac Assurance Corporation was listing under the weight of guarantees of the obligations of Ambac Credit Products, LLC---a non-insurance subsidiary which had sold protection to holders of mortgage-related obligations via credit default swaps. Connie Lee's balance sheet, on the other hand, was insulated from the crisis at the flagship; more importantly, it had licenses to underwrite financial guaranty insurance in multiple jurisdictions. Various restructuring initiatives during 2008 were aimed at unleashing Connie Lee.[2]

[2] See, e.g., "Ambac Hopeful on Connie Lee Capitalization," Alistair Bair, *CBS Marketwatch*, 7/7/2008.

Thus, by mid-2008, it seemed possible that the future of the monoline insurance giant lay in wee Connie Lee. Consequently, one could argue that the potential claimants on Connie Lee (i.e., holders of bonds insured by Connie Lee prior to 1997) were in a safer position than their counterparts in the flagship company. In a sense, financial strength within the Ambac Group of companies had been inverted, with the flagship facing some danger of sinking, and a seemingly inconsequential subsidiary---once largely dependent on the flagship for safety---still healthy and being primed to set sail.[3]

Ambac's experience is interesting, but it is not clear whether it is representative. Perhaps one could find cases where the flagship or core companies were preserved, while ties to peripheral subsidiaries were opportunistically severed. The question of which is more common outcome---the body rotting and the limbs surviving, or vice versa---is the concern of this paper.

As we will see, the former outcome is more common, although both are observed. That is, when groups disintegrate with some affiliates surviving and others dying, the survivors are more subsidiaries that were not connected to the flagship company.

Related Literature and Background

Why do we see subsidiary structures in the first place? There are important institutional reasons for subsidiary structures in insurance groups. In particular, state regulation provides a variety of incentives for subsidiary use. Groups may form state-specific subsidiaries to take advantages of tax preferences or to guard against regulatory expropriation. Insurance liquidation laws typically put reinsurance claimants in a class subordinate to claimants under primary insurance contracts, so groups may form dedicated reinsurance subsidiaries to segregate collateral for reinsurance customers. Groups may also find subsidiary structures useful in recovering pricing flexibility in response to the constraints of state rate regulation---to the extent that such regulation targets the individual company rather than the group.

Theoretical analyses of subsidiary structure within corporate groups may help to explain the use of subsidiaries, as well as the differences in levels of group support granted to the various subsidiaries. Some use asset substitution and risk-shifting arguments to explain the segregation of risky and safe business within a financial group, with the common feature being the insulation of policyholder claimants and firm owners from distress at risky subsidiaries (e.g., Flannery, Houston, and Venkataraman (1993); Kahn and Winton (2004); Jaffee (2006); Ligon and Thistle (2007)). The general implication is that risky subsidiaries should be held at arm's length from the group. While the preservation of the option to default is generally value-enhancing within these models, an important counterpoint is raised by Gopalan, Nanda, and Seru (2007), who argue that reputational considerations provide strong incentives for groups to support troubled subsidiaries; they find confirming evidence by documenting severe consequences in terms of reduced access to external finance for groups who let subsidiaries go.

[3] This point is debatable. For example, S&P downgraded both Ambac and Connie Lee to "A" on November 19, 2008, so it was not clear that Connie Lee's recapitalization initiatives would succeed.

Empirical evidence has generally focused on the comparison of standalone companies to counterparts belonging to a group structure. It is well-known that conglomerates subsidize underperforming segments (Berger and Ofek (1995)): A seemingly obvious consequence is that, *ceteris paribus*, a struggling subsidiary will be more likely to survive in a group context than on its own. Empirical evidence suggests that this is indeed the case (e.g., Bechetti and Sierra (2003); Dewaelheyns and Van Hulle (2006); Gopalan, Nanda, and Seru (2007)). However, the support granted by groups to "non-core" subsidiaries (i.e., those engaged in businesses not closely related to that of the parent organization) can vary over time. Lamont (1997) documents oil industry support of nonoil subsidiaries during boom times. Parental investment dropped as distress hit the oil industry in the 1980's, prompting the sale of nonoil subsidiaries as parents sought to raise cash. Using Belgian data, Dewaelheyns and Van Hulle (2006) find confirming evidence of the pattern of parental support observed by Lamont and, in particular, show that poor financial performance at the group level raises insolvency risk at noncore subsidiaries.

This paper adds to the preceding literature but departs by focusing on the risk differentials within business groups, rather than the risk differentials that exist between standalone firms and group-affiliated firms. The latter approach is well-established in the existing literature and echoes the stated methodology of rating agencies---where each company is assessed as a standalone entity before considering potential affiliate support. Such a methodology may address risk differentials between affiliated and non-affiliated firms, without correctly addressing the risks within the group itself. In particular, we are interested here in whether or not "core" subsidiaries within a financial group are safer in a relative sense than "noncore" subsidiaries. Is it safer to be a claimant on a flagship? A subsidiary explicitly supported by the flagship through reinsurance? Or a peripheral subsidiary enjoying no explicit support from affiliates?

The usual presumption is that the first priority of an organization is to save the flagship, as well as other core subsidiaries integral to its ongoing operation. Yet, if reputational consequences of allowing default are severe, it is possible that this risk profile could become inverted: The only circumstances under which a group would allow a failure of any member are ones of deep distress, which may more typically originate in the larger, core business of the enterprise. And in cases of deep distress, unanticipated measures may be taken---such as the sale or spinoff of non-core subsidiaries---an endgame that may have the effect of making such subsidiaries safer in an *ex ante* sense.

III. Data and Variables

We start with a snapshot of the property-casualty insurance industry at year-end 1993 using statutory insurance data from that year and the 1994 edition of *A.M. Best's Insurance Reports – Property-Casualty.* A.M. Best's group definitions are used to assign each company to a group; standalone companies are discarded. We then use 1) subsequent editions of A.M. Best's Insurance Reports, 2) lists of liquidated companies from the NCIGF, and 3) web search methods to determine the fate of each company in

the sample by the early to mid-2008.[4] For each company, we collected data on ownership and within-group reinsurance arrangements (both of which are described in more detail below), as well as assets and Best ratings as of the end of 1993. We then tracked each company through ownership changes, mergers, and so forth through 2008. Sales of the company are noted, as are changes in status---such as liquidations, runoffs, and state supervision. When a company merged into or was absorbed by another, the ultimate fate of the acquirer was also recorded. There are 1603 companies and 400 groups in the overall sample.

Crucial for our purposes are measures of the strength of association among affiliates within the group, and we measure this along several dimensions.

Flagship Company

We define a *flagship* company as a company within the group that 1) ultimately owns (i.e., either directly or through wholly owned subsidiaries) at least 75% of the group's assets, 2) has ownership or reinsurance relationships with affiliates (counting itself) that together account for at least 90% of the group's assets, and 3) has ultimate ownership of (defined below) or reinsurance relationships with at least one affiliate.

The goal here is to identify the "central" company within the group structure, and the selection criteria usually yield the largest company within the group. As examples, the criteria yield Allstate Insurance Company as the flagship of the Allstate Group, Federal Insurance Company as the flagship of the Chubb Group, and State Farm Mutual Automobile Insurance Company as the flagship of the State Farm Group. In all of these cases, the "flagship" owns, either directly or indirectly, most of the subsidiary assets and plays a key role in providing internal reinsurance either through pooling arrangements or through bilateral contracts with subsidiaries.

Non-Core Affiliate

We consider two criteria in designating a company as being *non-core* to its group. The first concerns the name of the company: If the company carries the name of the group (e.g., Allstate), then it is considered to be a "core" company. If it does not carry the name of the group but underwrites business lines characteristic of the type of group that it belongs to,[5] then it is also considered to be "core." A company failing both of these tests is deemed to be *non-core*.

Reinsurance guarantees

[4] The sample was collected in the spring and summer of 2008.

[5] The procedure used to determine whether a company underwrites business lines "characteristic" of its group involves two steps. First, we use a cluster analysis to classify groups according to the percentage distribution of their gross written premiums; we then calculate a similarity index between each company and the average distribution of gross written premiums within its group's cluster. Different cutoffs for the similarity index are then prescribed within each cluster, and companies are classified accordingly. More details are provided in Appendix A.

The most common type of support between insurance company affiliates is reinsurance: A company providing reinsurance protection agrees to indemnify the buyer for claims suffered on its underlying insurance contracts. We have two sources of information on reinsurance between affiliates. The first is the A.M. Best volume, which offers textual descriptions of significant reinsurance arrangements for each company; the second is a list of reinsurance transactions contained in Schedule F of the statutory reports.

We collect several pieces of information about reinsurance for each company. First, we determine whether or not the company has a reinsurance protection with the flagship company (if one exists)---such a relationship is defined to exist 1) if there is a reinsurance purchase listed in Schedule F or 2) if the A.M. Best volume lists a relationship. Second, we use similar methodology to determine whether the company has reinsurance protection with any affiliate. We also collect measures of the extent of current internal reinsurance participation---the percentage of gross written premiums ceded to affiliates, as well as the fraction of gross written premiums assumed from affiliates.

Ownership Structure - 1993

For each company, we used five categories to describe the nature of its affiliation with the group.

1. *Independently owned* – assigned to publicly traded companies and mutuals or reciprocals, where ownership does not reside within a property-casualty or holding company of the group
2. *Top holder owned* – assigned to all companies directly owned by the top holding company, if one exists
3. *Direct subsidiary* – assigned to all companies directly owned by property-casualty companies in the group
4. *Indirect subsidiary* – assigned to companies owned by intermediate holding companies within the group structure
5. *Small affiliate* – assigned to county mutuals and Lloyd's syndicates, where the management company may be controlled by the group, but the residual claims are not owned by the group.

In cases where a company fits into more than one ownership category (for example, if it is partly owned by a top holding company and partly owned by a property-casualty company), the assignment is based on the owner that owns the most.

For direct subsidiaries, we noted the owner(s) within the group and the percentage(s) of ownership. For both direct and indirect subsidiaries, we determined the ultimate owner(s) and ultimate ownership percentage(s): That is, we determined which of the "independently owned" and "top holder owned" companies ultimately held ownership of the subsidiary (possibly through intermediate subsidiaries and holding companies). We also note whether the company is owned by the flagship company. Ultimately, there proved to be little difference between indirect and direct subsidiaries, and we combine

these in the empirical analysis by defining categorical variables only for the first, second, and third categories enumerated above.

Failure

We treated any company---either in its original form or as part of a merged entity---that had not "failed" by 2008 as having survived. An exception to this characterization is for companies that were sold as "clean shells" by parents or groups that subsequently failed. The characterization of "clean shell" is ambiguous in our data in that the "cleaning" could be accomplished by a *novation* (i.e., transfer of contracts from the shell to the seller---in which case the original policyholders now look to the seller for indemnification) or reinsurance provided either by the seller or a third party (in which case the original policyholders are still claimants on the original company after the sale).[6]

With better data, we might be able to discriminate between cases of novation (where, from the perspective of the policyholders, the sale essentially boils down to a merger of their interests with those of the seller) and reinsurance (where, from the perspective of policyholders, the sale simply amounts to a transfer of ownership of the residual claims). Unfortunately our data does not permit this distinction, so we calculate two measures of company fate---one where we treat all sales of clean shells as mergers with the seller (i.e., we assume that all sales were accompanied by novation) and one where the claimants are assumed to follow the fate of the sold company (i.e., we assume that all sales were accompanied by reinsurance).

We identify three types of company failure. The first (*liquidation*) is an involuntary liquidation. The second (*supervision*) is a seizure of the company by a state regulator. The third (*distressed runoff*) is the trickiest to define.

A company in *runoff* ceases to underwrite new and renewal business, except that which is mandated by regulation or by contract. The company then "runs off" its liabilities by settling claims and *commuting* existing insurance and reinsurance contracts by offering contract holders a cash settlement to void the contract. Runoff can be benign, as when a financially strong group places a subsidiary into runoff after deciding to exit a particular line of business; in these cases, claimants can expect to be paid in full. Runoff can also be malignant when it serves as an alternative to involuntary liquidation for individual companies and for groups; in some cases, troubled subsidiaries of otherwise healthy groups are sold to runoff specialist firms to manage the dissolution of the impaired subsidiary. In the distressed form of runoff, certain claimants (e.g., those with "long-tailed" exposures) typically take haircuts. We define a distressed runoff as any runoff where either 1) the company was sold to a runoff specialist before being placed into runoff or 2) the company was rated B+ or lower prior to being placed into runoff.

[6] Another possibility concerns the case of cut-through reinsurance endorsements, where the seller agrees to "cut through" a buyer's insolvency to indemnify claimants, should such insolvency emerge. In this case, claimants are in theory protected from insolvency at either the buyer or the seller, but not both. We do not explicitly model this case.

Estimated Risk

A.M. Best's had three broad categories of assigned ratings in 1994.

The first was a familiar letter rating scale that ranged from A to F, with ++, + and – modifiers for the letters A, B, and C. D was reserved for companies deemed "very vulnerable," E was reserved for those that had been placed under state supervision, and F was assigned to those that were in the process of liquidation. To qualify for a letter rating, companies had to meet certain requirements, including a minimum size requirement and a requirement of at having at least 5 years of operating experience. About 72% of the universe of property casualty companies followed by A.M. Best in 1994 received a letter rating.

Those that did not qualify for a letter rating could still qualify for an FPR rating, which was a numerical scale running from 2 to 9 (FPR 2 to FPR 9), with higher numbers indicating greater strength. About 8% of the universe described above received an FPR rating.

The remaining 20% of companies that received neither a letter rating nor an FPR rating received a "Not Assigned" rating of some kind, with the vast majority being companies that either did not meet the requirements of the other two categories or for whom A.M. Best judged their rating procedure to be "inapplicable" (with the latter being assigned a rating of NA-4).

The challenge is to merge these three rating categories into a single numerical scale of assessed risk. Fortunately, A.M. Best provides a basis for matching FPR ratings to letter ratings. In some cases, the match is one-to-one. In others, one FPR is matched to two letter ratings; in these cases, the FPR is considered to lie between the two letter ratings in terms of risk. The "estimated risk" variable is constructed to represent an estimate of the 15-year failure probability corresponding to each rating. The estimates, as well as details on the construction of the variable, are provided in Table 1.

The Not Assigned category, containing all companies that were not assigned ratings for any reason, actually ends up having failure experience only slightly worse than an A- company. This is not all that surprising when one recognizes that the average rating in the company universe is in the neighborhood of A-.

IV. Empirical Methodology and Results

We run two sets of regressions. The first set identifies the association between our various ownership structure and support variables and the perceived risk of group-affiliated companies. The second set identifies the association between our variables and the failure of companies.

Both analyses are conducted within the context of a conditional logit (i.e., fixed effects logit) model, where the fixed effect is the group. Thus, we are limiting our attention to cases where there were within-group differentials in risk assessment (for the first set of regressions) or failure outcomes (for the second set).

Predicting Ex Ante Risk Assessments with Group Structure and Reinsurance Variables

We first document the association between estimated risk and organizational characteristics. Table 2 presents sample statistics for the analyses in Columns (1) and (2) of Tables 3 and 4. We use two different dependent variables. The first (*Risky*) is a dummy variable indicating whether a company's estimated risk was higher than its asset-weighted group average estimated risk; the second (*Non-Letter*) is a dummy variable indicating whether the company was awarded a non-letter rating (i.e., either an FPR or Not Assigned rating).

We use conditional (fixed effect) logit models, with the fixed effect specified at the group level---with the consequence that the models draw information only from groups that had rating differentials among affiliates. When using *Risky*, the model uses 924 company (and 181 group) observations; the corresponding figures for *Non-Letter* are 703 and 125.

The evidence in Table 3 suggests that core companies were generally assigned safer ratings than non-core companies. In particular, flagship companies were judged to be safer than the group average; in the specifications of Table 4, we see the companion result that larger companies within the group tend to be more likely to receive a letter rating. Non-core affiliates (*Non-core*) generally were perceived to be riskier, as were inactive subsidiaries (many of these were assigned non-letter ratings as a matter of policy by A.M. Best).

With respect to internal reinsurance arrangements, both Tables show that reinsurance relationships with the flagship (*Flagship Reinsured*) and with other affiliates (*Other Affiliate Reinsurance*) tended to be judged favorably by A.M. Best. Affiliates that reinsured with the flagship in some fashion were less likely to receive a non-letter rating, and tended to have higher risk (although the latter effect does not reach the usual standards for statistical significance). With respect to providing reinsurance, the regressions indicate that those who provided some level of guarantee (*Guarantee*) tended to be safer companies relative to those who did not, although this effect could be offset by the degree of support provided (as measured by the *Assumption Ratio*)---as risk perception was rising in the fraction of total business that represented business assumed from affiliates. The negative coefficient on *Ceding Ratio*, on the other hand, suggests that affiliate reinsurance support was correlated with safer rating assignments, regardless of the degree of dependence.

With respect to ownership, the results were mixed. The positive coefficient on *Independently Owned* suggests that public or privately owned stock companies tended to have riskier rating assignments. Less can be said of non-stock companies---mutual, reciprocal companies, and Lloyd's syndicates---which were either "independently

owned" or small affiliates (*Small Affiliate*), but the negative coefficient on the *Non-stock* variable tended to offset the positive coefficients on the other variables.

Predicting Failure with Group Structure and Reinsurance Variables

To explore the association between failure and organizational characteristics, we try three definitions of failure. The first (*Fail #1*) defines a company to have failed if it is liquidated, placed under state supervision, or placed into distressed runoff by 2008. The second (*Seized*) is the same as the first, except that runoff companies are treated as survivors rather than failures. The third (*Fail #2*) starts with a presumption that any company sold as a shell transferred its liabilities through novation to its parent prior to the sale. This definition thus differs from the first definition only in cases where a company was sold a shell: Specifically, if the company were sold as a shell and the shell subsequently failed while the original parent survived, the company is deemed to have survived (in the sense that claimants were made whole). Conversely, if the company were sold as a shell and subsequently survived while the parent failed, it is deemed to have failed.

We again use conditional (fixed effect) logit models, with the fixed effect specified at the group level. Focusing only on groups where members experienced differential outcomes with respect to failure results in a significant restriction of the sample. The sample now ranges from 158 to 290 companies and 32 to 49 groups, depending on the dependent variable used.

Columns (3) to (5) of Tables 3 and 4 reveal patterns opposite to that suggested by the ex ante risk assessments in several respects that meet the usual standards for statistical significance. Flagships appear to have greater tendency toward financial impairment than their affiliates. Moreover, affiliates dependent on the flagship for reinsurance support also tended to be at greater risk for failure. To illustrate in terms of raw numbers (and using *Fail #1* to define failure), 25 of 49 groups with differential failure outcomes had flagship companies. In those 25 groups, 15 (or 60%) of the flagships failed, while about one third of the non-flagship affiliates (39 of 116) failed. Of those 116 affiliates, 79 had reinsurance with the flagship---and, of those, 32 (41%) failed; the failure rate among the remaining 37 was only 19%.

Other coefficients for the most part to fail the usual standards for statistical significance but, interestingly, as often as not have the opposite sign to the associations identified in the first set of regressions. For example, non-core affiliate status was associated with lower rates of failure; non-stock firms were associated, ceteris paribus, with higher rates of failure; and inactive status was associated with lower rates of failure.

Including *Estimated Risk* itself in the conditional logit model did not materially change the results, and it was only weakly predictive of subsequent failure within the subset of groups that had differential survival outcomes, even when used alone in the model. We also experimented with expanded definitions of coreness---e.g., splitting out the "name" criterion and the "underwriting" criterion as separate variables measuring "coreness."

V. Conclusion

The sample, though comprehensive in the context of the property-casualty insurance industry, is---for purposes of identifying risk differentials within insurance groups---effectively limited to a few dozen groups where affiliates had different experience with respect to failure outcomes. The results should thus be viewed cautiously. Nevertheless, they do suggest that the relative risks within groups and the true value of explicit and implicit support commitments may not be well understood.

Overall, the results suggest that group flagships---if anything---were at greater risk of failure than their lesser subsidiaries. Affiliates who were not dependent on the flagships for reinsurance support had better survival chances than those who depended on the flagships. These findings run counter to the conventional wisdom about strength in insurance groups, as reflected in the ratings assigned in 1994---which awarded higher grades to flagships and to those pooling or reinsuring with flagships. Moreover, we find little evidence that other measures of "coreness" were associated with failure risk.

One interpretation is that reputational considerations and regulatory barriers are sufficiently strong to dissuade groups from opportunistically cutting ties to small, troubled subsidiaries in most cases---even if no explicit commitments have been made. Therefore, the circumstances under which we see failures within a group (aside from cases where the group disintegrated before the onset of trouble---for example, through the sale of parts of the group)---are ones where the group as a whole is experiencing severe distress. Severe distress is more likely to originate from large mistakes or significant misfortune in the core of the group, and in such situations the flagship will drag down anything that can't be cut loose on its trip to the bottom. But what can be cut loose will be cut loose (i.e., sold) in an effort to save the firm.

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Table 1 - Failure Rates and Estimated Risk by 1994 A.M. Best Rating

Rating	Observations	% Failed	Estimated Risk	Rating	Observations	% Failed	Estimated Risk
A++	127	3.9%	3.5	**FPR9**	0	N/A	3.6
A+	341	3.5%	3.7				
A	383	13.1%	13.0	**FPR8**	1	0.0%	13.0
A-	306	16.0%	15.8	**FPR7**	4	0.0%	15.8
B++	54	25.9%	21.9	**FPR6**	10	0.0%	21.9
B+	45	28.9%	28.3	**FPR5**	8	25.0%	28.3
B	27	44.4%	32.0	**FPR4**	11	18.2%	33.0
B-	8	12.5%	34.1				
C++	2	50.0%	39.8	**FPR3**	6	50.0%	41.1
C+	4	0.0%	42.4				
C	3	66.7%	49.6	**FPR2**	1	0.0%	51.1
C-	0	N/A	52.8				
D	5	60.0%	60.0				
E	10	70.0%	70.0				
F	11	81.8%	81.8				
Unassigned	235	16.6%	16.6				

"Observations" refers to the number of sample companies assigned to each rating category by A.M. Best in 1994. "% Failed" refers to the percentage identified by the author as having failed (in liquidation, under supervision, or in distressed runoff) by the summer of 2008. "Estimated risk" is constructed as 100 times the fraction of companies that failed within the following groupings: A and FPR8, A- and FPR7, B++ and FPR6, B+ and FPR5, D, E, and F. In the remaining cases, an FPR rating was matched to more than one letter rating: For these, an overall failure rate was calculated for the group of 3 ratings (e.g., FPR4, B, and B-), and then distributed across the three ratings by assuming that the FPR rating corresponded to a risk level between the two letter ratings. The distribution was accomplished by constraining the weighted average of the group to equal the empirical group failure rate and by assuming that each rating was related to the one above it by the square root of .94 (.94 was the average ratio of the higher rating's failure rate and the lower rating's failure rate for the A++/A+, A/A-, and B++/B+ pairs in the sample). The exception to this characterization is the C++ / FPR6 / C+ group, where use of the group's empirical failure rate of 33% in conjunction with the allocation method described above would have resulted in an inversion of the overall rating scale (e.g., estimated risk for C++ would have been lower than that for B-). Accordingly, this group's failure rate was calculated as the average of the two neighboring group's failure rates; the subsequent application of the allocation methodology then resulted in a monotonic gradient of estimated risk across assigned A.M. Best rating categories.

Table 2 - Sample Averages: Ex Ante Risk Prediction & Failure Prediction Models

Variable	Definition	Dependent Variable				
		Risky	Non-Letter	Fail #1	Seized	Fail #2
Flagship	Company satisfies requirements described in Section III	0.1234	0.1053	0.0862	0.0949	0.0739
Flagship Reinsured	Pools with or reinsures in flagship	0.2359	0.2205	0.2724	0.1646	0.2435
Other Affiliate Reinsurance	Pools with reinsures in non-flagship affiliate	0.6894	0.6942	0.7897	0.6899	0.8000
Non-core	Company fails to meet requirements described in Section III	0.3063	0.3201	0.3172	0.3354	0.3304
Inactive	GPW less than or equal to zero	0.0768	0.0853	0.0586	0.0696	0.0652
Guarantee	Provides reinsurance to affiliates	0.4968	0.4979	0.5759	0.5190	0.5826
Independently Owned	Publicly owned or mutual	0.1017	0.0882	0.0828	0.0886	0.0826
Top Holding Company Owned	Owned by top holding company	0.2035	0.1878	0.1552	0.1899	0.1435
Direct Subsidiary	Owned by property-casualty insurance co.	0.4394	0.4481	0.4448	0.3354	0.4609
Indirect Subsidiary	Owned by intermediate holding company	0.2002	0.2119	0.2586	0.3354	0.2522
Direct or Indirect Subsidiary	Direct Subsidiary=1 or Indirect Subsidiary=1	0.6396	0.6600	0.7034	0.6709	0.7130
Small Affiliate	County mutual or Lloyds affiliates	0.0552	0.0640	0.0586	0.0506	0.0609
Nonstock	Non-proprietary ownership structure	0.1418	0.1366	0.1448	0.1456	0.1522
Assumption ratio	Reinsurance assumed from affiliates divided by 1993 GPW, floored at 0 and capped at 1, and set to 0 if GPW=0	0.1807	0.1951	0.2086	0.1769	0.2013
Asset Ratio	Company assets / Group assets	0.1991	0.1778	0.1690	0.2025	0.1565
Ceding ratio	Reinsurance ceded to affiliates divided by 1993 GPW, floored at 0 and capped at 1, and set to 0 if GPW=0	0.3112	0.3327	0.3765	0.3303	0.3948
Risky	Estimated Risk > group average	0.4058	-	0.3793	0.3418	0.3826
Non-Letter	Did not receive a letter rating from A.M. Best	-	0.2589	0.1586	0.2025	0.1522
Fail #1	Seized=1 OR company placed into distressed runoff	-	-	0.3655	-	-
Seized	Company liquidated or placed under supervision by 2008	-	-	-	0.4114	-
Fail #2	Fail #1=1 (if company was never sold, or if company failed before being sold), OR parent failed after company sold.	-	-	-	-	0.3609
Estimated Risk	Empirical failure probability x 100 (see Table 1)	14.578	14.336			17.118
Observations (companies)		924	703	290	158	230
Observations (groups)		184	125	49	32	36

Table 3 - Conditional Logit Model Results					
	Ex Ante Risk Prediction		Failure Prediction		
Dependent Variable	Risky	Non-Letter	Fail #1	Seized	Fail #2
	(1)	(2)	(3)	(4)	(5)
Flagship	**-1.70**	**-2.78**	**1.55**	**1.86**	**1.81**
	(0.47)	(0.87)	(0.57)	(0.67)	(0.98)
Flagship Reinsured	-0.50	**-1.46**	**1.27**	0.36	**1.88**
	(0.41)	(0.54)	(0.57)	(0.93)	(0.84)
Other Affiliate Reinsurance	**-0.90**	**-1.35**	-0.11	0.59	-0.43
	(0.32)	(0.47)	(0.55)	(0.62)	(0.58)
Guarantee	**-0.67**	**-0.83**	-0.16	-0.06	-0.29
	(0.25)	(0.44)	(0.43)	(0.54)	(0.47)
Independently owned	**1.46**	0.20	-1.02	-1.38	**-2.91**
	(0.59)	(0.84)	(1.34)	(2.00)	(1.37)
Top Holding Company Owned	**0.63**	-0.03	0.53	0.51	**1.13**
	(0.28)	(0.44)	(0.50)	(0.51)	(0.66)
Small Affiliate	0.64	1.27	-1.37	-1.07	**-3.07**
	(0.62)	(0.82)	(1.29)	(1.99)	(1.33)
Non-stock	**-1.00**	**-1.97**	0.68	0.44	**2.21**
	(0.55)	(0.84)	(1.20)	(1.96)	(1.15)
Non-core	**0.59**	**0.94**	-0.21	-0.26	-0.41
	(0.24)	(0.35)	(0.52)	(0.66)	(0.60)
Inactive	**0.91**	**2.39**	-0.42	-0.49	-1.02
	(0.47)	(0.74)	(0.80)	(1.03)	(0.94)
Observations (companies)	924	703	290	158	230
Observations (groups)	184	125	49	32	36
Pseudo R-squared	0.14	0.41	0.06	0.08	0.11

Standard errors are robust to clustering by group. Statistical significance at the 10% level (or lower) indicated with bold type.

Table 4 - Conditional Logit Model Results					
	Ex Ante Risk Prediction		Failure Prediction		
Dependent Variable	Risky	Non-Letter	Fail #1	Seized	Fail #2
	(1)	(2)	(3)	(4)	(5)
Flagship	**-1.41**	**-1.37**	**2.33**	**2.00**	2.00
	(0.53)	(0.82)	(0.82)	(0.83)	(1.28)
Flagship Reinsured	-0.43	-0.99	**1.26**	0.28	**1.76**
	(0.44)	(0.63)	(0.61)	(0.92)	(0.81)
Other Affiliate Reinsurance	**-0.83**	**-1.38**	-0.01	0.53	-0.55
	(0.31)	(0.41)	(0.62)	(0.64)	(0.63)
Guarantee	**-1.15**	**-1.62**	-0.19	0.00	-0.31
	(0.31)	(0.60)	(0.50)	(0.65)	(0.55)
Independently owned	**1.67**	1.01	-0.98	-1.33	**-2.90**
	(0.64)	(1.19)	(1.32)	(1.95)	(1.46)
Top Holding Company Owned	**0.75**	0.69	0.96	0.68	1.23
	(0.30)	(0.45)	(0.61)	(0.56)	(0.75)
Small Affiliate	0.78	1.76	-1.59	-1.29	**-3.44**
	(0.63)	(1.22)	(1.31)	(2.01)	(1.44)
Non-stock	**-0.99**	**-2.80**	0.88	0.55	**2.35**
	(0.58)	(1.37)	(1.20)	(1.98)	(1.26)
Non-core	0.42	0.58	-0.49	-0.38	-0.48
	(0.26)	(0.39)	(0.53)	(0.73)	(0.62)
Inactive	0.70	**1.97**	-0.73	-0.46	-0.89
	(0.46)	(0.64)	(0.88)	(1.12)	(1.05)
Asset Ratio	-0.70	**-3.50**	-1.76	-0.50	-0.39
	(0.53)	(1.17)	(1.10)	(1.14)	(1.45)
Ceding Ratio	-0.54	**-1.11**	-0.29	0.21	0.49
	(0.37)	(0.63)	(0.59)	(0.60)	(0.66)
Assumption Ratio	**1.30**	**1.88**	0.17	0.10	0.50
	(0.50)	(0.73)	(0.74)	(0.92)	(1.04)
Observations (companies)	924	703	290	158	230
Observations (groups)	184	125	49	32	36
Pseudo R-squared	0.16	0.50	0.07	0.09	0.12

Standard errors are robust to clustering by group. Statistical significance at the 10% level (or lower) indicated with bold type.

Appendix A – Measurement of "Non-core" Underwriting

In designating a company as being "core" or "non-core" with respect to its group, we considered two factors. The first, discussed in the text, is whether or not the company carried the group name. The second factor was whether or not the company was engaged in underwriting business lines typically associated with its group. While the first factor is easily evaluated, the second is more complicated.

To be sure, there are some groups of specialist companies---for example, groups that generate more than 90% of their premiums in a single line, such as auto or medical malpractice---where discrimination between core and non-core companies may be straightforward. However, many groups are multi-line enterprises, constructed as such to deliver a full service menu of offerings to their clients. In these cases, it is more difficult to determine whether a company is core or non-core.

To address this, we start by calculating the percentage distribution of each group's external business (i.e., all direct premiums and all reinsurance assumed from non-affiliates) across the lines of business captured by the Underwriting and Investment Exhibit in the statutory annual statement for the 1993 data year. We then calculate a *similarity index* for each company by calculating the dot product between the company's distribution and the group's distribution across the 28 lines of insurance, as in:

$$Similarity\ index = \sum_{l=1}^{28} company\_pct_l * group\_pct_l$$

We then perform a partition cluster analysis based on these percentages at the group level (using the *cluster kmeans* command in STATA); we select 16 clusters, based on a high value of the Calinski-Harabasz pseudo-F index. For each cluster, we examine the distribution of similarity indices for companies belonging to groups within each cluster and select a cutoff level for the similarity index. That is, a company with a similarity index below the cutoff level is judged to be engaged in underwriting business lines not typically associated with the group's business model. Such a company would then be designated as "non-core" if it did not carry the group's name.

Table A describes the clusters of companies, characterizes their nature, and discloses the cutoff threshold for the similarity index.

Table A - Description of Cluster Analysis Results and Similarity Index Thresholds				
Cluster	# of Groups	Similarity Index Threshold	Description	Main Lines
1	25	0.25	Commercial Multi-Line, Liability emphasis	Other Liability (58%)
2	68	0.15	Multi-line, Personal emphasis	Auto Liability (39%), Auto Phys Dam (22%), Homeowners (12%)
3	9	0.19	Allied Lines Specialists	Allied Lines (50%)
4	30	0.50	Reinsurance Specialists	Reinsurance (94%)
5	2	0.85	Financial Guaranty Specialists	Financial Guaranty (96%)
6	43	0.35	Auto Specialists	Auto Liability (66%), Auto Physical Damage (24%)
7	1	0.50	Aircraft Specialists	Aircraft (81%)
8	16	0.50	Med Mal Specialists	Med Mal (96%)
9	16	0.25	Workers Comp Specialists	Workers Comp (73%)
10	8	0.30	Fidelity & Surety Specialists	Surety (80%)
11	67	0.15	Commercial Multi-Line, Auto emphasis	Auto Liability (27%), Auto Phys Dam (13%), CMP (14%), Workers Comp (14%)
12	45	0.15	Commercial Multi-Line, Non-Auto emphasis	Workers Comp (15%), CMP (15%), Other Liability (10%)
13	11	0.25	Fire & Allied Lines emphasis	Fire (60%), Allied Lines (13%)
14	31	0.15	Homeowners emphasis	Homeowners (50%), CMP (12%)
15	17	0.15	Multi-line, Reinsurance emphasis	Reinsurance (43%), Auto Liability (10%)
16	9	0.30	Auto Physical Damage emphasis	Auto Phys Dam (56%), Auto Liability (11%)