# Peeking Under the Sheet of Schumpeter's Ghost: Further Investigations into Hypercompetition

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## INTRODUCTION

The few studies that have addressed the issue of the existence and incidence of Schumpeterian behavior of firms (Schumpeter, 1939) from an empirical perspective have not yielded a consensus based on either existence or incidence. This paper will summarize the data, methodology and conclusions of a recent study by the authors (Wiggins and Ruefli, 2005) that found support for Shumpeter's argument that over time competitive advantage would become significantly harder to sustain and, further, that the phenomenon is limited neither to high technology industries nor to manufacturing industries but is seen across a broad range of industries (D'Aveni, 1994, 1999). We also found evidence that sustained competitive advantage is increasingly a matter not of a single advantage maintained over time but more a matter of concatenating over time a sequence of advantages. These findings were contrasted with findings of the leading antecedent empirical investigation of hypercompetition, McNamara, Vaaler,and Devers (2003). Comparing results of their study with our study yielded discrepancies that were noted and for which explanations were proposed. Moving beyond that completed research, to shed further light on the area, we will "peek under the sheets" and present new and more detailed empirical results that will address some of the differences in findings.

## SUMMARY OF WIGGINS AND RUEFLI (2005)

**Objectives:** Wiggins and Ruefli (2005) observed that the notion that competitive advantage will become increasingly more difficult to sustain in a wide range of industries is the key implication of Schumpeter's theory of competitive behavior— augmented and brought up to date in the idea of hypercompetition. Following Schumpeterian theory and D'Aveni's (1994) logic, Wiggins and Ruefli's (2005) main hypothesis was that we should see the average period for which firms sustain a competitive advantage decrease over time. Also following Schumpeter, Wiggins and Ruefli's (2005) second hypothesis was that hypercompetition is not limited to high technology industries, but occurs throughout most industries. Our third hypothesis was based on D'Aveni's (1994: 7) assertion that, "strategy in hypercompetitive environments now focuses on developing a set of temporary advantages." The resulting third hypothesis was that over time firms increasingly have sought to sustain competitive advantage by concatenating a series of short-term competitive advantages. To test these hypotheses we employed data from the COMPUSTAT PC-Plus database

that yielded a sample that includes an overlap with Thomas' (1996) sample and is a superset of the sample used by McNamara, *et al*. (2003). Performance was measured by ROA and Tobin's q.

**Summary of Methods:** Most statistical techniques employed in examinations of the persistence of abnormal profits are based on measures of central tendency and focus on mean behaviors. To avoid the limitations of traditional parametric techniques, Wiggins and Ruefli (2005) employed a set of nonparametric methodologies. Superior economic performance was operationalized as statistically significant above average (relative to the industry or other reference set) performance over a five year period, determined using the Iterative Kolmogorov-Smirnov stratification technique (Ruefli & Wiggins, 2000). Sustained superior performance was operationalized as superior performance that lasted six or more consecutive five-year windows (i.e., ten years). This establishes a very stringent test for the performance effects of hypercompetition and one that is tied directly to Schumpeterian theory, in that it is only the significant shortening of the periods during which *only those firms with significant sustained competitive advantage* that will be accepted as evidence. After the data were classified by the IKS method, the rest of the analysis concentrated solely on those firms in the superior stratum. In other words, our analyses were driven by the *small but significant differences* between the firms that maintain persistent superior economic performance and those that attained it but lost it, as opposed to the *very large differences* between above-average performers and average and below-average performers used by all previous studies.

We tested our first two hypotheses by using discrete time event history analysis techniques (Allison, 1984; Tuma and Hannan, 1984) to estimate models of the rates at which the leading firms exit the superior performance stratum. To test hypothesis three we examined the frequency of a performance pattern of superior, not superior, then superior performance over time in the two halves of the longitudinal sample. If the assertions surrounding hypercompetition were true, this pattern should become significantly more prevalent over time. The likelihood ratio chi-square test was then employed for the patterns produced by ROA and by Tobin's q.

**Summary of Findings:** For both performance measures, the hazard of exiting the persistent superior performance stratum increased in a statistically significant fashion over time (see Tables 1 & 2), supporting the hypothesis concerning the existence Schumpeterian competition. To test the scope hypothesis, the overall samples were divided into "high tech" industries and "low tech" industries. The "low tech" models showed that for both performance measures, the hazard of exit was statistically significantly increasing for the non-high-technology industries over time, although the magnitude of the hazard was lower than for the high-tech industries. For six of the seven

industries the ROA duration variable was statistically significant at the 0.05 level or better—and was not limited to high technology industries, providing additional support for the hypothesis that Schumpeterian competition was nearly ubiquitous. The results for the likelihood ratio chi-square test of association for the patterns (superior, then less-than-superior, then superior performance) produced chi-squares that were significant in both cases at the $\alpha = 0.001$ level, indicating that the performance pattern is more prevalent in the last decade of the study than it was in the prior decade—supporting our third hypothesis that firms are increasingly concatenating short term advantages. These results provide evidence that support Schumpeter's theory.

**Summary Comparison:** The most recent published large-scale empirical examination of hypercompetition was McNamara, *et al.* (2003) and is the study most comparable to the one summarized here. Their study of a subset of the firms in this study included an autoregressive model similar to that used by Mueller (1986) and Jacobson (1988), but included an interaction term to examine changes in the rate of decay of performance (both superior and inferior). This interaction term was not significantly different from zero, indicating no significant change in the decay rate over time. This study also reported no increase in mortality rates, no increasing trend in industry dynamism, and no decreasing trend in industry munificence. While we do not dispute their findings on mortality, dynamism, and munificence, and we applaud their focus on changes in the rate of decay in their autoregressive models, we reiterate our arguments about the use of autoregressive models that admix superior, average, and inferior performers, do not compensate for over-all trends in performance, require parametric assumptions, and are sensitive to outliers. Further they do not address the primary effect mentioned in Schumpeterian theory and argued by D'Aveni (1994): the increased difficulty in sustaining a competitive advantage.

Reasons why our results differ from those of the most comparable study, McNamara *et al*. (2003), would include first, the difference in methods; second, their study examined the decay of persistence for all business units while our primary method only examined persistently superior performing business units and firms; and third, while both studies used multiple samples and multiple methods, their study included many other variables (dynamism, mortality, stability) that no proponent of the hypercompetitive approach has directly discussed, making most of their tests indirect tests, while our primary methods all focused solely on direct tests of Schumpeterian theory regarding persistent superior performance.

## PEEKING UNDER THE SHEETS

These findings will be in three parts. First, while Wiggins and Ruefli (2005) focused on the behavior of superior performing firms, here we will present an examination of the behavior of all firms in the sample. In particular, we will examine the pattern of transitions between the modal, superior and inferior strata of performance over time. We have presented evidence that Schumpeterian competition affects firms that were able to sustain superior performance over periods of 11 or more years; other studies, such as McNamara et al (2003) have found little supporting evidence for Schumpeterian competition when all firms in the sample were examined. It would be enlightening to see how the effects of Schumpeterian competition are evidenced when all firms are examined.

Second, we will examine the behavior of firms that had statistically significant inferior performance to see if their behavior reveals evidence of Schumpeterian competition. This is potentially important because those studies that employ auto-regressive models implicitly examine the combined behavior of superior and inferior performers. Further, Thomas and D'Aveni (2004) report increased number of spells of financially distressed performance on the part of unstable firms. Our examination will consist of the application of the methodologies in Wiggins and Ruefli (2002), (2005) to ascertain whether inferior performance is sustainable and, if so, is the average period for which it can be sustained changing over time.

Third, we will examine if the effects of Schumpeterian competition that were found in Wiggins and Ruefli (2005) at the firm level also extend to the behavior of industries and business units within firms. Again, our examination will consist of the application of the methodologies in Wiggins and Ruefli (2002), (2005).

### Performance Behavior of All Firms in Sample

**Objective:** The main analysis in Wiggins and Ruefli (2005) employed an event history methodology that focused on the performance of those firms that held a superior performance position for at least ten years. These firms were select to fit the key assertion of Schumpeterian theory that industry leaders would be subject to increasing threats from competition. The findings of the analysis supported the Schumpeterian theory—and disagreed with findings in the antecedent literature (e.g., McNamara, et al., 2003). In addition to the reasons for the differences in findings given in Wiggins and Ruefli (2005), another possibility is that in focusing on the behavior of all the firms in an industry, the antecedent literature masked the effects of Schumpeterian competition. To

investigate whether or not this might be the case, we re-examined our data for all the firms in the industries studied. The methodological approach employed was to compute the conditional transition matrices for the three performance strata, superior, modal and inferior for all of the firms in each industry on a split-half basis. Condition transition matrices were computed for the first and last fifty percent of the years studied. These matrices were then tested for similarity employing minimum discriminant information (MDI) statistics.

**Method:** MDI statistics (Brockett, 1991; Gokhale and Kullback, 1978) based on Kullback-Leibler (KL) numbers (Kullback and Leibler, 1951) were computed for the differences between each first-half conditional transition matrix, P, and the second-half conditional transition matrix, Q, under the null hypothesis that the matrices were the same. These statistics are dimension-free and independent of the size of the matrices involved. The MDI statistic, in the form of the KL statistic, $\ell(q|p)$, is:

$$\ell\left(q|p\right)=\sum_{i=1}^{N}\sum_{j=1}^{N}\frac{q_{i.j}}{p_{i,j}} \qquad (1)$$

and is chi-square distributed with *N* dof. Brockett (1991: 77) notes that the KL number "can be thought of as the (pseudo-) distance or 'closeness' between P and Q within the space of all probability measures." Note that $\ell(q|p) = 0$ if and only if p = q (Brockett, 1991), so the critical chi-square values of interest in hypothesis testing are those closer to zero.

**Results:** Table 3 in its top two sections reports the aggregate transition matrices for the entire sample of firms for the performance metrics of ROA and Tobin's q for the first and second halves of the period studied. The MDI statistics for both performance dimensions are not significant—even at the 0.1 level, indicating that the transition processes for the second half of the study do not differ in a statistically significant fashion from their counterparts in the first half. Although not shown here, the same results obtained when the transition matrices for the first and second halves of the study were computed for ROS. Similar results obtained when transition matrices were computed on an industry by industry basis. The MDI statistics revealed no statistically significant differences between the first and second half matrices for any of the industries examined. The lower section of Table 3 illustrates this with the transition matrices for SIC 357x.

**Discussion:** These results are in agreement with those obtained by McNamara, et al., (2003); how is it that they are not in agreement with the results found in Wiggins and Ruefli

(2005)? The transition matrices are computed from the same stratification categories obtained by Wiggins and Ruefli; what makes the difference?

The key to answering these questions is to note that in Wiggins and Ruefli (2005) the event history analyses that yielded the increasing hazard rates (indicating that periods of sustained competitive advantage were, on average, becoming shorter) were obtained, not from the entire sample, but from only those firms which sustained superior performance for ten periods or more. The implication here is that the effects of Schumpeterian competition cannot be detected in the behavior of all firms—but in the behavior of those firms identified by Schumpeterian theory as being on the receiving end of the negative aspects of Schumpeterian competition.

To draw an analogy with current events, if we were looking for the effects of global warming, we would not go around measuring the behaviors of millions of animals, plants, rocks or bodies of water. Such entities are embedded in the global climate changes to the point that the resulting data would be mostly noise. Instead, the theory of global warming tells us to look at the behaviors that are most likely to be clearly influenced by the phenomenon of global warming: the size and length of glaciers, the migratory patterns of temperature-sensitive birds, the growing and habitat ranges of plants, animals and insects. These are the coal-mine canaries of global warming—as the theory tells us. Similarly, the coal-mine canaries of Schumpeterian competition are the firms with sustained superior performance—as the theory indicates.

**Behavior of Inferior Performers**

**Objective:** Wiggins and Ruefli (2005) examined the behavior of superior performing firms and business units only, for reasons described above. Prior studies, such as McNamara, *et al.* (2003), had included the behavior of all firms, with substantially different results. In an effort to reconcile the conflicting results, in this new effort we focused on the inferior performing firms which had been eliminated from the models of Wiggins and Ruefli (2005).

**Methods and Results:** Using the same event history analysis methods, we modeled the exits from the inferior performance strata over time, with the results shown in Table 4 (models were also estimated with market share and the entropy measure of diversification as independent variables, but these variables were insignificant in all models and were removed and the models re-estimated). As can be seen from the first column of Table 4, the rate of exit from the inferior performance stratum increased over time, just as it did for the superior performing firms. However, when the exits are subdivided into "improvement" exits (firms whose improved performance caused them to move up into the modal or superior strata) and "death" exits (firms who ceased to be in the

sample through failure or acquisition by another firm), we found that the rate of "improvement" (or exits upward) did not significantly change over time. However, the rate of "death" exits (or exits out of the sample) significantly increased over time, and these exits drove the significance of the overall rate of all exits.

**Discussion:** This last finding is of special interest since McNamara *et al.* (2003) found that the overall mortality rate was *not* increasing over time. Of course, as with almost all mortality studies, no differentiation was made between the "death" of a poorly performing firm, which is usually due to firm failure leading to bankruptcy or acquisition at fire sale prices in the market for corporate control that leads to financial loss for the shareholders, and the "death" of a superior performing firm, which is usually the result of firm success and acquisition at a premium in the market for managerial talent that leads to financial windfalls for the shareholders. Hence our finding that the rate of "death" of poorly performing firms is increasing over time may be counterbalanced by a decrease in deaths in the modal performers and/or a decrease in the rate of modal and superior performing firms being acquired, leading to an overall rate that is not changing over time. Given the fact that Barber and Lyon (1996) found that the performance of all publicly traded firms is trending downward over time, and Wiggins and Ruefli (2005) found the same for business units of all publicly traded firms, this is a reasonable hypothesis, and one which we plan to test in the future.

**Industry/Corporation/Business Segment Persistence**

**Objective:** Hamel and Prahalad (1994:32-33) argue that competition is at the corporate level, and the research in Wiggins and Ruefli (2005) and here were all based on overall firm performance. However, both McGahan and Porter (1999) and Ruefli and Wiggins (2003:875) found persistence of performance varied at differing levels of analysis. Specifically, both studies found that industry performance was the most persistent over time, corporate performance was the next most persistent, and segment performance was the least persistent. Following those results, we would expect that the effects of hypercompetition would be the strongest at the business-unit level, the next strongest at the corporate level (where the business-unit level effects are aggregated), and have the least effect at the industry level. This leads to two related hypotheses:

**Hypothesis 1a:** *The chance of loss of persistent superior economic performance will increase most rapidly at the segment level.*

**Hypothesis 1b:** *The chance of loss of persistent superior economic performance will increase next most rapidly at the corporate level.*

**Methodology and Results:** To test these hypotheses we used Cox regression hazard models to estimate the hazard rates of exiting the superior performance stratum because it allowed us to directly compare the differing cumulative hazard rates at the business unit, corporate, and industry levels. The results for the Cox regression model are shown graphically in Figure 1, which illustrates the cumulative hazard of exiting the superior performance strata at each of the three levels of analysis. As can be seen, for most of the periods studied, the cumulative hazard rate was highest for industry, indicating the least persistence, then for segment and lowest for corporate—quite contradictory with the industry view (McGahan and Porter, 1999). However, in the last few periods things changed; chances of leaving the superior performance stratum increased markedly for corporate and business segment entities and the final cumulative hazard ended up highest for the SBU (segment) level, indicating the least persistence, followed by the corporate level, and trailed by the industry level, indicating the most persistence.

**Discussion:** This is consonant with the findings of McGahan & Porter (1999) and Ruefli & Wiggins (2003) only in the last period of our current study. Thus not only are both hypothesis 1a and 1b supported by this analysis—instability has increased at all levels, but there has been a shift across levels—in recent years industry level performance became less persistent corporate and segment stability were even less persistent—and at an increasing rate. This may indicate that reduced diversification in recent years has increased corporate instability.

## CONCLUSION

Wiggins and Ruefli (2005) provided evidence, based on a targeted test of Schumpeterian theory across a wide range of industries, that competitive advantage has become increasingly difficult to sustain. That research also indicated that increasingly firms are attempting to concatenate short term advantages over time. The additional research reported here indicates that including all firms in a sample may mask the effects of Schumpeterian competition. Further examination of all inferior performers indicated that firms going out of business increased as a percentage over time and finally that a significant reduction in persistence occurred across all of the levels of industry, corporation., and segment levels. Together these findings indicate the need for additional studies employing differing methodologies and differing data sets of the performance behavior of firms.

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**Table 1**

**Maximum Likelihood Estimates of Persistent Superior Performance Exit (Tobin's q), 1977-1997**

| | Model | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | All* | HiTech | LoTech | SIC 1 | SIC 2 | SIC 3 | SIC 4 | SIC 5 | SIC 6 |
| Period | .1056•• | .164 | .083•• | .0929 | .1294•• | .0559 | .4670• | .0149 | -.0193 |
| | (.0267) | (.170) | (.028) | (.0704) | (.0496) | (.0338) | (.1857) | (.0549) | (.0958) |
| Density | .0024 | -.022 | .005 | -.0077 | .0069 | .0036 | -.1835• | .1057•• | .0120 |
| | (.0057) | (.023) | (.006) | (.0077) | (.0088) | (.0037) | (.0933) | (.0382) | (.0124) |
| Size | .1364•• | .200 | .140• | .1070 | .0648 | .2121• | .0674 | 1.8823• | .5805 |
| | (.0029) | (.111) | (.057) | (.0874) | (.0883) | (.0853) | (.2505) | (.7596) | (.4027) |
| Entropy | -.2013 | -.401 | -.206 | -.0712 | .2028 | -.0544 | -.6151 | .6349 | -1.2539 |
| | (.3319) | (1.441) | (.352) | (1.5334) | (.5256) | (.5479) | (1.4927) | (1.1327) | (2.3288) |
| 4-Firm | -3.0668 | -10.888 | -2.705 | -8.1127 | -.6766 | 1.8730 | -25.9281• | 10.7668 | 3.5486 |
| Conc. Ratio | (2.8403) | (12.667) | (3.100) | (4.0253) | (1.7509) | (1.4900) | (12.2061) | (6.1061) | (7.6483) |
| Market | .3339 | -11.229 | .571 | -1.7927 | .5061 | -10.6449 | 141.0405 | -51.8844 | -1.6021 |
| Share | (1.6170) | (13.784) | (1.619) | (11.0903) | (1.8993) | (6.5968) | (116.7311) | (27.0414) | (5.7924) |
| SIC3812 | 2.1056• | | | | | | | | |
| | (.9809) | | | | | | | | |
| SIC3841 | 2.5042• | | 2.411• | | | | | | |
| | (1.0077) | | (1.130) | | | | | | |
| Log-likelihood | -369.06 | -53.84 | -304.33 | -51.14 | -91.48 | -117.09 | -28.21 | -40.07 | -25.24 |
| Spells | 1436 | 234 | 1129 | 221 | 348 | 443 | 107 | 173 | 104 |

* Notes: Non-significant industry dummy variables omitted. SIC 7 model had too few events to be estimated.

•• is significant at the 0.01 level.

• is significant at the 0.05 level.

**Table 2**

**Maximum Likelihood Estimates of Persistent Superior Performance Exit (ROA), 1977-1997**

| | Model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | All* | HiTech | LoTech | SIC 1 | SIC 2 | SIC 3 | SIC 4 | SIC 5 | SIC 6 | SIC 7 |
| Period | .1563••• | .152•• | .122••• | .2337••• | .1312•• | .0831•• | .0745 | .1412•• | .1531• | .2566• |
| | (.0189) | (.061) | (.018) | (.0478) | (.0425) | (.0273) | (.0449) | (.0548) | (.0724) | (.1121) |
| Density | -.0078 | -.016 | -.001 | .0037 | -.0479••• | -.0001 | -.0101 | .0125 | .0266• | -.0342 |
| | (.0043) | (.011) | (.004) | (.0022) | (.0111) | (.0026) | (.0075) | (.0121) | (.0104) | (.0210) |
| Size | .0099 | .180 | -.008 | -.0317 | .1358 | .0971 | .2032 | .4019 | .0213 | .1389 |
| | (.0540) | (.103) | (.055) | (.1030) | (.1789) | (.0951) | (.1886) | (.3583) | (.2203) | (.2439) |
| Entropy | .5441• | .561 | .160 | .4797 | .9483 | .2342 | .8936 | 1.1201 | .8982 | -2.2531 |
| | (.2290) | (.562) | (.231) | (.5546) | (.5354) | (.4013) | (.5820) | (.6466) | (.7505) | (1.6678) |
| 4-Firm | -.4001 | -5.255 | .367 | .9339 | -2.3239 | -.3455 | .6542 | 2.6870 | 5.0832 | -6.4580 |
| Conc. Ratio | (1.8570) | (4.839) | (1.931) | (1.1356) | (1.8382) | (1.1441) | (1.3748) | (2.6019) | (3.9076) | (4.9201) |
| Market | .4192 | -2.174 | .304 | -2.5558 | -2.0569 | -.9033 | -9.7181 | -8.4810 | 3.9099 | 3.3328 |
| Share | (1.2727) | (3.337) | 1.284 | (3.5270) | (2.3705) | (2.3306) | (8.2464) | (11.3193) | (3.1217) | (4.8130) |
| SIC3714 | 2.6850• | | | | | | | | | |
| | (1.1286) | | | | | | | | | |
| SIC3812 | 2.1411• | | | | | | | | | |
| | (.9648) | | | | | | | | | |
| SIC3841 | 2.3901• | | | | | | | | | |
| | (1.0848) | | | | | | | | | |
| SIC4512 | | | 1.800• | | | | | | | |
| | | | (.853) | | | | | | | |
| Log-likelihood | -723.81 | -172.95 | -663.32 | -131.57 | -92.49 | -217.14 | -87.73 | -79.44 | -65.62 | -42.33 |
| Spells | 3735 | 662 | 2897 | 522 | 755 | 918 | 449 | 536 | 292 | 263 |

* Note: Non-significant industry dummy variables omitted.

••• is significant at the 0.001 level.

•• is significant at the 0.01 level.

• is significant at the 0.05 level.

## Table 3

**Conditional Transition Matrices 1977-1996**

**ROA All Firms MDI = -0.007**

77 to 86

| ► | +1 | 0 | -1 |
|---|---|---|---|
| +1 | 0.858 | 0.142 | 0.000 |
| 0 | 0.047 | 0.889 | 0.063 |
| -1 | 0.001 | 0.146 | 0.853 |

87 to 96

| ► | +1 | 0 | -1 |
|---|---|---|---|
| +1 | 0.872 | 0.125 | 0.003 |
| 0 | 0.043 | 0.895 | 0.062 |
| -1 | 0.000 | 0.130 | 0.870 |

**Tobin's q All Firms MDI = -0.017**

77 to 86

| ► | +1 | 0 | -1 |
|---|---|---|---|
| +1 | 0.721 | 0.251 | 0.027 |
| 0 | 0.020 | 0.967 | 0.013 |
| -1 | 0.101 | 0.284 | 0.615 |

87 to 96

| ► | +1 | 0 | -1 |
|---|---|---|---|
| +1 | 0.694 | 0.249 | 0.056 |
| 0 | 0.026 | 0.952 | 0.022 |
| -1 | 0.114 | 0.317 | 0.569 |

**ROA Office Equipment and Electronic Computing**

SIC 357X MDI = -0.005

77 to 86

| ► | +1 | 0 | -1 |
|---|---|---|---|
| +1 | 0.764 | 0.236 | 0.000 |
| 0 | 0.041 | 0.864 | 0.095 |
| -1 | 0.000 | 0.123 | 0.877 |

87 to 96

| ► | +1 | 0 | -1 |
|---|---|---|---|
| +1 | 0.765 | 0.235 | 0.000 |
| 0 | 0.035 | 0.881 | 0.084 |
| -1 | 0.000 | 0.154 | 0.846 |

Where: +1 = superior performance; 0 = modal performance; -1 = inferior performance

## Table 4

**Maximum Likelihood Estimates of Inferior Performance Exit (ROA), 1976-1997**

| Variable | All Exits | Model Exits Up (Improvement) | Exits Out ("Deaths") |
|---|---|---|---|
| Period | 0.103••• | 0.036 | 0.337••• |
| | (.021) | (.022) | (.044) |
| $Period^2$ | -0.004••• | -0.002 | -0.014••• |
| | (.001) | (.001) | (.002) |
| Density | 0.002••• | 0.002••• | 0.001 |
| | (.000) | (.000) | (.000) |
| Four-Firm | 0.596••• | 0.610••• | 0.586 |
| Conc. Ratio | (.170) | (.192) | (.305) |
| Size | 0.059••• | 0.090••• | -0.022 |
| | (.009) | (.011) | (.015) |
| Log-likelihood | -4151.10 | -3426.02 | -1713.01 |
| Events | 1,796 | 1,336 | 406 |
| Spells | 7,724 | 7,264 | 6,388 |

••• is significant at the 0.001 level.

**Figure 1**

**Cox Regression Cumulative Hazard of Superior Performance Exit (ROA), 1980-1996**