ECONOMIC SHOCKS, COMPETITION AND MERGER ACTIVITY

by

KEVIN OKOEGUALE

(Under the Direction of J. Harold Mulherin)

ABSTRACT

Why mergers occur remains to some extent a puzzle in corporate finance. The merger literature presents a good number of alternative theories on the drivers of merger activity. Some of these theories are clearly linked to efficiency and others are not. One well documented phenomenon is that merger activity clusters at the industry-level. Much of this industry-level clustering has been linked to economic shocks from deregulation and technological changes. It is important to better understand the role that efficiency plays in how economic shocks from deregulation and technological changes drive merger activity. In the first essay of my dissertation, I investigate the role of the competitive mechanism in how economic shocks from deregulation and technological changes drive merger activity, controlling for the effect of valuations. I show that these shocks drive merger activity by increasing industry competition. Deregulation drives merger activity by increasing entry and cash flow volatility. Technological changes drive merger activity by increasing entry and inter-firm dispersion in the quality of production technology.

The imperfection in proxy variables and ambiguity in relative valuation measures such as market-to-book (M/B) inhibit efforts to contrast alternative theories on the drivers of merger activity, particularly in multi-industry studies. The telecommunications industry is one where both deregulation and technological changes have been clearly linked to increases in merger activity. In the second essay, I study how merger activity in the telecommunications industry fits within the

framework of the economic shocks theory in contrast to the misvaluation theory. I show that the increase in merger activity following the 1996 deregulation was an efficiency-driven restructuring response to increased entry, cash flow volatility and inter-firm dispersion in the quality of production technology. I find insignificant changes to stock valuations after deregulation.

The positive association between competition and merger activity following telecommunications deregulation, however, is consistent with several possible motives for the mergers. This third essay is an event study analysis of alternative theories on the motives behind the cluster of merger following the 1996 deregulation. The evidence that mergers after telecommunications deregulation generate positive announcement abnormal returns to the stockholders of the merging firms is consistent with both collusion and efficiency theories. The negative announcement abnormal returns to bidders suggest hubris as a possible motive. I examine these alternative theories by studying the announcement abnormal returns to rivals of merging firms, including the Nynex/Bell Atlantic merger challenged by the FCC on collusion concerns. I find strong support for anticipation and the signaling of potential synergies between rivals and subsequent bidders through telecom bidding activity. The markets' response to the announcement of the Nynex/Bell Atlantic merger shows little evidence that the merger would have had collusive or anticompetitive effects.

INDEX WORDS: Mergers, Economic shocks, Deregulation, Technological changes, Competition, Restructuring, Efficiency, Misvaluation, Collusion

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DEDICATION

I dedicate this work first to God for sustaining me, and to my Father (Clement K. Okoeguale) and Mother (Theresa E. Okoeguale). I also dedicate this work to my family and to my friends who gave me their support.

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CHAPTER 1

INTRODUCTION

Why do mergers occur? This is a fundamental question in corporate finance that still remains to some extent a puzzle, in light of the scale of merger activity in recent decades. Holmstrom and Kaplan (2001) argue that shareholder value became dominant in the 1980s and 1990s in part at least because capital markets have a comparative advantage in undertaking the kind of structural reforms that deregulation and technological change necessitated. Merger activity in the United States was substantial in the 1980s and in the second half of the 1990s, and continued at a remarkable scale and pace in the 2000s after the 2001 recession. U.S. companies were involved in deals amounting to almost \$1.5 trillion in 2006, a record year for mergers.

Corporate finance researchers have succeeded in formulating and supporting empirically a good number of alternative theories on the drivers of merger activity. Some of these theories are clearly linked to efficiency and others are not. One well documented phenomenon is that merger activity clusters at the industry-level. Much of the evidence on the industry-level clustering of merger activity, observed in the 1980s and 1990s, has been linked to economic shocks from deregulation and technological changes. Substantial levels of merger activity are bound to have long-run implications for industry performance, and thus it is important to better understand the role that efficiency plays in how economic shocks from deregulation and technological changes drive merger activity. This is the primary motivation for this research.

In particular, I consider three related questions. First, what is the mechanism through which economic shocks from deregulation and technological changes drive the industry-level clustering of merger activity? Second, how do these shocks from deregulation and technological changes translate into merger activity through this mechanism? Third, what are the implications of the answers to the previous questions for tests and inferences on the motives for mergers following economic shocks from deregulation and technological changes?

The first essay of my dissertation contributes to the literature on the drivers of merger activity by investigating specifically the role of the competitive mechanism in how economic shocks from deregulation and technological changes drive merger activity, controlling for the effect of valuations. Using a sample of 6,943 M&A transactions involving public U.S. targets and public acquirers in 48 industries and for the period from 1980 to 2009, I show empirically that economic shocks from deregulation and technological changes drive merger activity by increasing industry competition. Deregulation drives industry merger activity by increasing entry and cash flow volatility. Technological changes drive merger activity by increasing entry and inter-firm dispersion in the quality of production technology. These inferences underscore the role of the competitive mechanism in how managers reallocate assets to more efficient uses via mergers and can be extended to other sources of economic shocks that also have the potential to induce a more competitive environment.

Multi-industry studies have the advantage of allowing for macro-level inferences, but given that there are many proxy variables and there may be different things occurring in different industries at the same time, a single industry study allows for a more focused contrast of alternative theories. In the second essay, I take advantage of a "natural experiment" provided by the 1996 Telecommunications Act to examine specifically the role of the competitive mechanism in how deregulation and technological changes translate into merger activity; how merger activity in the telecommunications industry fits within the framework of economic shocks (Harford, 2005), in contrast to misvaluation (Rhodes-Kropf et al., 2005). The passage of the 1996 Act facilitated entry and the expansion of new communication technologies, including fiber optic, cellular, cable and internet. I show that the increase in merger activity, following deregulation, was an efficiencyimproving restructuring response to increased competition and not increased misvaluation. The competitive mechanism played a role in how managers in the telecommunications industry reallocated resources via mergers in response to deregulation and technological changes.

The positive association between competition and merger activity following telecommunications deregulation, however, is consistent with several possible motives for the mergers. The increase in competition following deregulation may well have driven the increase in merger activity by generating incentives for telecom firms to seek out production efficiencies or to collude. The third essay is an event study analysis of alternative theories on the motives behind the cluster of mergers following the passage of the Telecommunications Act of 1996. The evidence that mergers after telecommunications deregulation generate positive announcement abnormal returns to the stockholders of the merging firms is consistent with both collusion and efficiency theories. The negative announcement abnormal returns to bidders suggest hubris as a possible motive. I examine these alternative theories by studying the announcement abnormal returns to rivals of merging firms using an approach pioneered by Eckbo (1983) and Stillman (1983).

I find that, on the initial merger announcement following deregulation, the mean abnormal return to rivals of the merging firms is positive, which supports the collusion and anticipation hypotheses but not the competitive hypothesis that the merging firms will be replaced by a new entity more competitive than rivals. The positive mean abnormal return to rivals also does not lend support to the hubris hypothesis, unless perhaps the merger results in a new entity that will be less competitive than rivals. The significantly larger positive mean abnormal return to rivals who become subsequent targets within one year of the initial merger announcement does not support the collusion and hubris hypotheses, but supports the anticipation hypothesis that the initial merger signals that rivals will become acquisition targets amidst opportunities for potential synergies.

I also analyze the abnormal return patterns associated with the second and third merger announcements following deregulation. The abnormal return patterns associated with these subsequent merger announcements show that: 1) the market appears to be able to extract mergerspecific information from bid announcements to distinguish between subsequent targets/bidders and subsequent non-targets/non-bidders, but does not appear to be able to predict the first target/bidder. 2) A substantial amount of the bidding activity that occurred following deregulation in the telecommunications industry is anticipated by the market. The announcement abnormal return patterns do not support the FCC's view that the Nynex/Bell Atlantic merger, the third merger announcement, would facilitate the exercise of unilateral power by the merged entity and enhance risk of coordinated pricing. The patterns show little evidence that the merger would have had collusive or anticompetitive effects, but support anticipation of potential mergers between the remaining Baby Bells and subsequent bidders.

In conclusion, my dissertation research contributes to our understanding of why mergers occur by showing that economic shocks from deregulation and technological changes drive merger activity through the competitive mechanism. These economic shocks translate into merger activity by increasing the level of entry and facilitating the expansion of new technologies. The evidence supports the view that increases in competition following deregulation and technological changes generate incentives for firms to seek out production efficiencies through mergers.

CHAPTER 2

ECONOMIC SHOCKS, COMPETITION AND MERGER ACTIVITY

2.1 Introduction

In 2000 the aggregate value of mergers between public U.S. targets and public acquirers was over \$940 billion based on data from Security Data Company's (SDC) M&A database. Six industries consisting of deregulated and high-tech industries – petroleum and natural gas, utilities, banking, communication, computer software, and electronic equipment – collectively accounted for more than two-thirds of the total activity in 2000. The general observation is that merger activity, as in 2000, tends to cluster within a few industries during periods of high aggregate merger activity. An important research question is whether an efficient mechanism drives this industry-level clustering.

There are a number of alternative theories on the drivers of merger activity. Some are clearly linked to efficiency and others are not. For example, the economic shocks theory considers mergers as an efficiency-improving response to changes to industry structure. In contrast, the misvaluation theory considers the primary driver of mergers to be stock market misvaluations, although it is plausible that a merger driven by misvaluation could also end up providing some efficiency benefits where synergies exist. The same could be said of other theories such as empire building and hubris.

Once an economic, regulatory or technological shock occurs, managers simultaneously react and then compete for the best or most efficient combination of assets (Harford, 2005). This study contributes to the literature on the drivers of merger activity by investigating specifically the role of the competitive mechanism in how economic shocks from deregulation and technological changes drive merger activity, controlling for the effect of valuations. Using a sample of 6,943 M&A transactions involving public U.S. targets and public acquirers in 48 industries and for the period from 1980 to 2009, I show empirically that economic shocks from deregulation and technological changes drive merger activity by increasing industry competition.

Prior research provides strong empirical evidence linking the industry-level clustering of merger activity in the 1980s and 1990s to changes to industry structure brought about by economic shocks from deregulation (Mitchell and Mulherin, 1996; Mulherin and Boone, 2000; Andrade et al., 2001). Jovanovich and Rousseau (2002) use a Q-theory model of mergers to show that the merger waves of the 1980s and 1990s were a response to profitable reallocation opportunities attributable to economic shocks from technological changes. But what is less understood is the mechanism through which economic shocks from deregulation and technological changes drive merger activity.

I begin my investigation by documenting the patterns of M&A activity over the 30-year sample period and confirm that merger activity in the 1980s and 1990s clusters at the industry-level, with deregulation playing an important role. Deregulated industries account for 31% of the total value of M&A activity in the 1980s and 51% in the 1990s. The industries impacted by major deregulation events in the 1990s – petroleum and natural gas, utilities, communication, and banking – also account for about 36% of the total value of M&A activity in the 2000s. Eight industries classified as "high-tech" by the OECD (Organization for Economic Co-operation and Development), based on R&D intensity, account for 18%, 38% and 39% of the total value of M&A activity in the 1980s, 1990s and 2000s, respectively. This study also contributes to the prior literature by introducing evidence from the 2000s and "high-tech" industries – on the role of technology.

I hypothesize that economic shocks from deregulation and technological changes drive merger activity through three potential channels: by increasing entry, by increasing cash flow volatility and by increasing inter-firm dispersion in the quality of production technology. Deregulation and technological changes increase entry by removing or reducing barriers to entry. The increase in entry is expected to increase industry competition and the feasible set of merger possibilities. Cash flow volatility is expected to increase as competition increases with entry; higher cash flow volatility or lower correlations between firms' cash flows increases the probability of exit via bankruptcy – a merger is an alternative means of exit. Inter-firm dispersion in the quality of production technology is expected to increase with the expansion of new technologies because firms adapt to new technologies at different rates, and this would increase potential merger synergies.

I use the Q-theory model of mergers (Jovanovich and Rousseau, 2002) to illustrate how economic shocks from deregulation and technological changes would lead to an increase in interfirm dispersion in Tobin's Q and in merger activity through the competitive mechanism, consistent with the stylized fact that high market-to-book firms (M/B – proxy for Tobin's Q) buy lower M/B firms. Deregulation and the arrival of new technology allow the set of input-output combinations to expand (Jovanovich and Rousseau, 2001). Mergers move assets to more valued uses (Maksimovic and Phillips, 2001).

The univariate evidence shows that, following major deregulation events during the 1990s, increases in industry M&A activity are associated with increases in industry competition. Industry competition, measured by either the level of entry, number of firms or industry concentration, increased after the deregulation events in the petroleum and natural gas, communication and banking industries. Periods of high cash flow volatility also occurred as a result of increased competition following deregulation in petroleum and natural gas, utilities and communication. I also find that the high levels of M&A activity observed in the late 1990s and early 2000s in "high-tech" industries were preceded by high levels of competition and high rates of R&D investment, which contributed to excess capacity during the 2000 Nasdaq stock market crash and the 2001 recession.

For the "high-tech" industries, the correlation between the rate of R&D investment and measures of industry competition is highly positive.

The main result from the multivariate regressions, using the full sample panel data, is that industry M&A activity is positively associated with the level of entry and cash flow volatility. The result is robust to controlling for the effect of potential stock market misvaluation and variation in the investment opportunity set. The evidence underscores the role of competition in how managers reallocate assets to more efficient uses via mergers. In order to draw clearer inferences about the channels through which economic shocks from deregulation and technological changes drive merger activity, I run separate sub-sample regressions for deregulated and "high-tech" industries. I examine whether the channels differ in their importance to deregulation and technological changes.

The deregulated industries – petroleum and natural gas, utilities, communication, banking and transportation – are industries impacted by major deregulation events since the late 1970s. As mentioned earlier, the "high-tech" industries – medical equipment, pharmaceutical, aircraft, computer hardware, computer software, electronic equipment, and measuring & control – are industries classified as "high-tech" by the OECD. The communication industry qualifies as both a deregulated and a "high-tech" industry but it is treated as a deregulated industry for the purpose of this analysis.

For deregulated industries, I find that industry M&A activity is positively associated with the level of entry and cash flow volatility. Here, I do not find evidence of an association between industry M&A activity and inter-firm dispersion in the quality of production technology. For "high-tech" industries, I find that industry M&A activity is positively associated with the level of entry and inter-firm dispersion in the quality of production technology. For "high-tech" industries, I find that industry M&A activity is positively associated with the level of entry and inter-firm dispersion in the quality of production technology. Overall, the evidence shows that these shocks drive merger activity by increasing industry competition. Deregulation drives industry merger

activity by increasing entry and cash flow volatility. Technological changes drive merger activity by increasing entry and inter-firm dispersion in the quality of production technology. These inferences underscore the role of the competitive mechanism in how managers reallocate assets to more efficient uses via mergers and can be extended to other sources of economic shocks such as industry overcapacity, financing innovations, globalization, international trade, demand shocks and input costs shocks that also have the potential to induce a more competitive environment.

Related questions have been investigated by other studies. For instance, Ahern and Harford (2010) examine the role of product market relationships in how economic shocks lead to merger waves and show that vertical links or customer-supplier relations strongly predict inter-industry merger waves. Garfinkel and Hankins (2010) provide evidence suggesting that risk management is one of the underlying economic reasons for the link between vertical integration and merger waves. Garfinkel and Hankins show that merger waves are more likely to start following periods when many firms in an industry experience increasingly volatile cash flows. These roles of vertical industry links and risk management in how merger waves propagate fits within the larger context of the role of competition in how economic shocks drive industry merger activity.

The remainder of this paper proceeds as follows. Section 2.2 describes the M&A data and the variables employed in the study. Section 2.3 develops the hypotheses and the empirical testing approach. Section 2.4 presents the empirical results, first from the univariate analysis of the impact of deregulation and technological changes on industry competition, and second from the multivariate tests. Following the discussion of the empirical results, Section 2.5 concludes the paper.

2.2 Data

I extract all mergers and acquisitions recorded in Thompson Financial's Securities Data Company (SDC) M&A Database and satisfying the following criteria: 1) the transaction announcement date is between January 1, 1980 and December 31, 2009; 2) the transaction involves a U.S. public target and a public acquirer, which excludes leveraged buyouts (LBOs) and management buyouts (MBOs); 3) the transaction value is equal to or greater than \$1 million; 4) the transaction deal status is "completed"; 5) the percentage of the target owned by the acquirer is greater than 50% after the transaction (more than 95% of the targets is 100% owned by the acquirer after the transaction) and is equal to or less than 50% before the transaction.

The transactions are assigned to 48 industry groups (by acquirer's industry) based on the Fama-French grouping scheme and using SDC recorded Standard Industry Classification (SIC) codes. The result is a sample of 6,943 M&A transactions assigned to their respective industry-years. I exclude transactions involving private firms to avoid data availability problems and because this study focuses on the merger decisions of managers of public firms that may be influenced by potential stock market misvaluations (Rhodes-Kropf et al., 2005). Misvaluations are attributed to either an inefficient stock market (Shleifer and Vishny, 2003) or asymmetric information between managers and investors (Rhodes-Kropf and Viswanathan, 2004).

In Table 2.1, I present summary descriptive statistics for the sample of 1440 industry-year observations – a panel data set of 48 industries from 1980 to 2009 – as well as statistics for subsamples by decade. This is in keeping with a decade by decade approach that prior studies employ extensively (see Mulherin and Boone, 2000; Andrade et al., 2001; Schleifer et al., 2003; Andrade et al, 2004; and Dong et al., 2006). I adjust all dollar values to 2009 dollars using the Consumer Price Index (CPI). The relatively low levels of M&A activity recorded for the 1980s is influenced by the fact that SDC coverage of M&As in the 1980s is less complete than since the 1990s (Netter et al. 2011). The range between the minimum and maximum industry-year observations relative to the mean for the full sample period, as well as in each decade, indicates clustering of mergers at the industry-level. Table 2.2 ranks the top 10 most active industries by value of M&A deals as a percentage of the total value of M&A deals in each decade. Although the composition of the most active industries changes from one decade to the next, some industries (e.g. deregulated industries like banking and communication) consistently show up in the rankings. In each decade the top 10 industries account for greater than 50% of the total activity. This is consistent with the evidence in Mitchell and Mulherin (1996), who document clustering at the industry-level (deals assigned by target's industry) during the 1980s, and Andrade and Stafford (2004), who document clustering at the industry-level (deals assigned by acquirer's industry) for the period from 1970 to 1994. Harford (2005) also documents industry-level clustering for the period from 1981 to 2000. For the 1980s sample, the top 10 active industries account for 77% and 74%, respectively.

Deregulated industries are marked with a single asterisk in Table 2.2 and account for a substantial amount of the M&A transactions across the decades. The industries that have undergone major regulatory reforms in recent decades include transportation (1978 & 1980), petroleum & natural gas (1978, 1981, 1989 & 1992), banking (1982, 1991, 1994 & 1999), communication (1982 & 1996), and utilities (1978, 1992 & 1996). Viscusi et al. (2005) provides a comprehensive list of the deregulation events. In the 1980s and 1990s, deregulated industries account for 31% and 51% of the total value of M&A activity, respectively. In the 2000s, after the major deregulation events of the 1990s, banking, communication, petroleum & natural gas, and utilities collectively account for about 36% of the total value of M&A activity. The fact that industries deregulated in the 1990s also become very active in the 2000s begs for explanations that extend beyond the neighborhood of a deregulation event.

Eight industries classified as "high-tech" by the OECD (Organization for Economic Cooperation and Development), based on R&D intensity, account for 18%, 38% and 39% of the total value of M&A activity in the 1980s, 1990s and 2000s, respectively. The "high-tech" industries in Table 2.2 are marked with double asterisks. The communication industry classifies as both a deregulated industry and a "high-tech" industry and is market with triple asterisks. The "high-tech" industries make up 5 of the top 10 industries in the 2000s, more than in the previous decades.

I construct the proxy variables for the empirical tests by matching stock price data from the CRSP monthly stock file to accounting data from the CRSP/Compustat Merged Fundamentals Annual file. I extract relevant financial information for firm-year observations from 1976 to 2009, resulting in a sample of 191,261 firm-year observations. The firm-year observations are assigned to the Fama-French 48 industries based on SIC codes and required to have values for market equity, book equity and book assets.

The level of entry, ENTRY, in an industry each year is the number of new CRSP listed firms (with CRSP Share Codes 10 & 11) and serves as a proxy for industry competition. An alternative proxy for industry competition is the Herfindahl-Hirschman index of industry concentration, HH INDEX, computed as the sum of the squared market shares (sales over total industry sales) of firms in an industry in a given year. I also use the number of CRSP listed firms (CRSP Share Codes 10 & 11) in an industry, after adjusting for firms with dual class shares, as an additional proxy for industry competition. Due to data availability, these measures of industry competition are imperfect as they do not incorporate data for private firms. This particular problem is mitigated by the fact that publicly traded firms typically account for the vast majority of the market share in an industry. A new CRSP listing often involves an initial public offering (IPO), where the IPO itself entails the raising of capital and access to the equity markets. Lowry (2003) shows that private firms' demand for capital and investor sentiment are important determinants of IPO volume. I measure industry cash flow volatility using the shocks to firms' cash flows. I compute the cash flow shocks using quarterly cash flow data from the CRSP/Compustat Merged Fundamentals Quarterly file. The firms' quarterly cash flows are scaled by the number of commons shares outstanding and then winsorized at the 1st and 99th percentiles. The quarterly cash flow shocks are then estimated from pooled cross-sectional and time-series industry-level regressions (see Irvine and Pontiff, 2009) that control for the seasonal variation and documented persistence in cash flow:

$$C_{ijt} - C_{ijt-4} = \varphi_1 + \beta_1 (C_{ijt-1} - C_{ijt-5}) + \beta_2 (C_{ijt-2} - C_{ijt-6}) + \beta_3 (C_{ijt-3} - C_{ijt-7}) + \mu_{ijt}$$
(2.1)

 C_{ijt} is the quarter *t* cash flow for firm *i* belonging to industry *j*. $C_{ijt} - C_{ijt4}$ is the difference between current quarter *t* cash flow and cash flow from four quarters ago (same quarter of the preceding year). The residuals, μ_{ijt} , from equation (1), deflated by quarter-end share price, are the quarterly cash flow shocks. The quarterly cash flow shocks are deflated by end of quarter share price. The cross-sectional standard deviation of firms' quarterly cash flow shocks, DISP CFLOW SHOCKS, measures industry cash flow volatility. Higher industry cash flow volatility implies lower correlations between firms' cash flows.

The proxies for inter-firm dispersion in the quality of production technology are the crosssectional standard deviation of return on sales, DISP ROS, and the cross-sectional standard deviation of return on assets, DISP ROA. Return on sales, ROS, is cash flow/sales and return on assets, ROA, is cash flow/book assets. The measure of cash flow is operating income before depreciation. I exclude observations with ROS or ROA larger than 1 or smaller than -1 before computing the standard deviations. The inter-firm dispersion in the rate of R&D investment, DISP R&D/ASSETS, computed as the cross-sectional standard deviation of R&D scaled by book assets is also a proxy for inter-firm dispersion in the quality of production technology. This proxy is particularly suited for "high-tech" industries, which are R&D intensive industries. Table 2.3a and Table 2.3b present summary statistics and correlation coefficients, respectively, for the proxy variables based on the industry-year observations – 48 industries over the 1980 to 2009 sample period. Table 2.4 presents the averages of industry-year M&A activity, by count and by value (\$ billions in 2009 dollars), and some descriptive variables for all 48 industries. The data indicates that deregulated industries exhibit relatively high ENTRY and low M/B over the sample period. "High-tech" industries exhibit relatively high R&D/ASSETS and high M/B.

2.3 Hypotheses Development

Deregulation and the arrival of new technology allow the set of input-output combinations to expand (Jovanovich and Rousseau, 2001). I propose that economic shocks from deregulation and technological changes drive merger activity by increasing industry competition. This is consistent with the notion that Managers are assumed to maximize the market value of their firms, and competition will force managers to reallocate resources to better uses.

Deregulation and technological changes have been part of a number of forces impacting U.S. businesses since the 1970s. These forces, beginning with the ten-fold increase in crude oil prices between 1973 and 1979, led to excess capacity and exit in the 1980s and the 1990s (Jensen, 1993). Financing innovations in high-yield bonds in the mid-1970s opened the public markets to small and risky firms. Advancements in communication and transportation technologies, along with the globalization of trade through international agreements, have created a global economy. The increase in international trade contributed to the lessening of the government's antitrust stance, and growth of foreign competition allowed more mergers to occur without creating monopoly power. These change forces created more competition, leading to deregulation, which increased competition further (Weston, 2001).

Federal regulatory agencies and the U.S. Congress began liberalizing pricing, entry, and exit in the transportation, financial, energy, and communications industries in the mid-1970s. The regulatory reforms spurred more competition, restructuring, market opportunities, innovative technologies and cost reductions in these industries. Deregulation forced firms to eliminate production inefficiencies that existed under previous regulatory structures (Winston, 1998). For example, entry barriers prevented airlines and motor carriers from developing their networks optimally, exit barriers prevented railroads from shedding excess capacity, and price regulations prevented natural gas pipelines from efficiently marketing their capacity during peak and off peak periods. The removal of entry and exit barriers decreased market power and provided firms with greater incentives to seek out efficiencies.

Substantial efficiency improvements and merger activity have generally occurred following an industry's deregulation due to increased competition (Winston, 1998). In the trucking and banking industries for instance, many weaker firms that were unable to compete effectively and efficiently in a deregulated environment sought a merger partner. Incumbent firms in the airline, banking and railroad industries used mergers to enter new markets after deregulation. Winston (1998) asserts that following deregulation, the net result of entry, exit, and mergers has generally been that competition in actual markets become more intense. I argue that deregulation, as well as technological changes, drive merger activity through three potential channels.

First, the removal of barriers to entry increases the feasible set of merger possibilities. Prior to the wave of deregulations in the late 1970s, merger possibilities were limited because mergers were either explicitly prohibited by law (e.g. in banking with the 1933 Securities Act) or because entry was constrained by regulations. The removal of entry barriers in utilities, natural gas, airlines and trucking that began in the late 1970s, partly in response to the energy crisis of the 1970s and innovations in production technologies, continued into the 1980s and 1990s, and impacted other industries such as banking and communication. For example, the passage of the Garn-St Germain Act of 1982 created a more competitive banking environment by allowing banks to enter new markets and threaten incumbents (Stiroh and Strahan, 2003).

Second, as competition increases with entry, cash flow volatility, uncertainty and the probability of exit are expected to rise. For example, the passage of the Motor Carrier Act of 1980 increased entry and price competition in the trucking industry (Zingales, 1998). Intense price competition resulted in exit via bankruptcy or liquidation of the less efficient and more leveraged firms – 4,589 trucking companies shut down between 1980 and 1985. The documented upward trend in idiosyncratic stock return risk over the past 40 years has been linked to increased competition, attributed in part to deregulation. The increase in competition following deregulation contributed to increased cash flow volatility or decreased correlations between firms' cash flows (see Gaspar and Massa, 2006; Irvine and Pontiff, 2009).

Sam Peltzman's (1976) regulatory buffering effect model predicts that firms will face a more risky profit stream in a deregulated environment than in a regulated one. As competition increases, a firm's success is expected to come increasingly at the expense of other firms, causing correlations between firms' cash flows to decrease. This contributes to higher cash flow volatility that in turn increases the probability of exit via bankruptcy or liquidation for marginally performing firms. Merger provides an alternative means to exit.

Third, deregulation may facilitate the arrival and expansion of new production technologies. For example, the deregulatory events leading up to the 1984 removal of the regulated monopoly status of long-distance phone service in the U.S. evolved contemporaneously with the development of microwave and fiber-optic technology by firms such as MCI and Sprint, making these firms viable competitors to AT&T's wireline network (Weston et al., 2004). The 1996 Telecommunications Act also facilitated entry and expansion of new communication technologies such as cable, cellular, internet etc. that offered alternatives to the services provided by local telephone companies.

The arrival of new technology increases the heterogeneity in the quality of firms' production technologies because firms adapt to new technology at different rates. New technology expands the set of input-out combinations and provides new sources of competitive advantage either through new products or new production processes. Innovations in production technology are often associated with new entry especially in environments where the pace of technological change is very rapid, as in "high-tech" industries. Rapidly changing technology causes production processes to change frequently, making operating costs and demand less predictable (Gort, 1969). Firms that are not able to quickly adapt become takeover targets for those firms that can most efficiently operate the new technology (Jovanovich and Rousseau, 2001).

I use the Q theory model of mergers (Jovanovic and Rousseau, 2002) to illustrate how economic shocks from deregulation and technological changes lead to increases in merger activity. The Q theory model shows that resources flow to better uses and better managers through mergers. Firm i employs production technology z_i to produce output using capital stock K_i:

$$output_i = z_i K_i$$
 (2.2)

An acquirer with output $z_A K_A$ bids for a target with output $z_T K_T$. There are gains to a merger when the target's z_T is low, i.e. productivity of its technology is low, and the acquirer's z_A is high. The output of the combined firm would be $z_A(K_A + K_T)$, which is higher than the sum of the two firms' pre-merger outputs by the amount $(z_A - z_T)K_T$. The value of K inside firm i takes the form $Q_i(z_i)K_i$, where Q_i is a function of the quality of firm i's production technology and is the ratio of market value to the replacement cost of capital. The merger creates value or synergies because $Q_A(z_A)K_T > Q_T(z_T)K_T$, i.e. the target's capital has a greater value inside the acquirer's firm. If all firms had the same z no M&A would take place. M&A should therefore rise, predicts the Q theory model of mergers, when the inter-firm dispersion in Q(z) is high.

I hypothesize that an increase in entry, following deregulation and technological changes, increases the number of potential merger combinations where $Q_A(z_A)K_T > Q_T(z_T)K_T$ and should lead to increased merger activity. I summarize this hypothesis as follows:

H1: Industry merger activity should be positively associated with entry.

As cash flow volatility increases with entry or competition, marginally performing firms will face a higher probability of exit via bankruptcy or liquidation. This is expected to be reflected in market valuations in the form of lower Q_i for marginally performing firms, and thus dispersion in Q(z) should rise.

H2: Industry merger activity should be positively associated with cash flow volatility.

Some firms will make more efficient use of new technology than others because firms adapt to new technology at different rates. I hypothesize that the expansion of new production technology, by increasing the heterogeneity in the quality of firms' production technologies, increases dispersion in Q(z) and should lead to increased merger activity.

H3: Industry merger activity should be positively associated with inter-firm dispersion in the quality of production technology.

$$M\&A_{it} = b_0 + b_1 Entry_{it} + b_2 Cash Flow Volatility_{it} + b_3 Disp in Technology_{it} + \varepsilon_{it}$$
(2.3)

I employ regression equation (2.3) in the empirical tests using industry-year M&A data and proxy variables for entry, cash flow volatility and inter-firm dispersion in the quality of production technology. The dependent variable, $M\&A_{i\sigma}$ is industry M&A activity measured by value (\$ billions in 2009 dollars) or count of deals for industry *j* at year *t*. Measuring M&A activity by value controls for size differences in M&A deals.

H1, H2, and H3 predict that the regression coefficients b_1 , b_2 , and b_3 , respectively, are positive. I test H1 using the number of new CRSP listed firms, ENTRY, as a proxy for the level of entry. I test H2 using the cross-sectional standard deviation of firms' quarterly cash flow shocks, DISP CFLOW SHOCKS, as a proxy for cash flow volatility. I test H3 using the cross-sectional standard deviations of return on sales, DISP ROS, as a proxy for inter-firm dispersion in the quality of production technology. The cross-sectional standard deviation of return on assets, DISP ROA, and the cross-sectional standard deviation of R&D scaled by book assets, DISP R&D/ASSETS, both serve as alternative proxies for inter-firm dispersion in the quality of production technology.

ROS or cash flow/sales serves as a proxy for production efficiency (Zingales, 1998). ROA or cash flow/assets is introduced as an alternative proxy for robustness check. ROS captures the relationship between operating revenues and operating costs, and thus serves as a convenient measure of the efficiency or quality of a firm's production technology across a wide range of industries. However, given inherent inter-industry differences in product market characteristics that could impact revenue and cost structures, these measures are subject to potential noise as proxies for the quality of production technology. The rate of R&D investment, R&D/ASSETS, serves as an additional proxy for the quality of production technology. In R&D intensive industries the rate of R&D investment is expected to closely reflect the rate at which a firm adapts to new technology.

An industry may experience a rise in industry Q(z) as a result of the arrival of new technology that increases investment or growth opportunities. The Q-theory model also predicts that merger activity should rise with investment opportunities, captured in Q(z). Andrade and Stafford (2004) find that merger and non-merger investments are positively related to an acquirer's

growth prospects. I therefore include industry M/B ratio in my regressions to control for potential endogeneity resulting from variation in the investment opportunity set (see Smith and Watts, 1992), as well as business conditions, capital liquidity, and potential stock market misvaluations.

2.4 Empirical Results

2.4.1 Univariate Analysis: Deregulated Industries

Deregulation is a relatively well-specified event and thus provides a natural setting for examining whether changes to industry M&A activity are associated with changes to industry competition. I begin by examining time-series patterns of M&A activity and proxies for industry competition for deregulated industries. For brevity I focus my analysis on major deregulation events that occurred during the 1990s.

In the petroleum and natural gas industry, the FERC (Federal Energy Regulation Commission) order 636 of 1992 required interstate pipeline companies to unbundle or separate their sales and transportation services. The purpose of the unbundling provision was to ensure that the gas of other suppliers could receive the same quality of transportation services previously enjoyed by a pipeline company's own gas sales. Unbundling increased competition among gas sellers and diminished the market power of pipeline companies¹. This resulted in a reallocation of market shares across firms in the industry.

Figure 2.1a shows that FERC order 636 of 1992 was followed by an increase in M&A activity (panel A) and a steady decrease in the Herfindahl-Hirschman index of industry concentration (panel B), indicating an increase in industry competition even though there wasn't much of a change in entry or the number of firms. Cash flow volatility rose temporarily in 1992 and

¹ U.S. Energy Information Administration

then declined. Cash flow volatility rose again in 1998 and was accompanied by a sharp rise in M&A activity.

In the utilities industry, the Energy Policy Act of 1992 amended the Public Utility Holding Company Act of 1935 to help small utility companies stay competitive with larger utilities. It also amended the Public Utility Regulatory Policies Act of 1978 and broadened the range of resource choices for utility companies. Following the deregulation, many utility firms chose to expand via mergers (Becher, Mulherin and Walking, 2012). Subsequent to the Energy Policy Act of 1992, the FERC also adopted a more liberal attitude towards mergers in the utility industry (Joskow, 2000). The FERC began to allow horizontal mergers across a broader geographic scope and vertical mergers between electric utilities and natural gas utilities.

Figure 2.1b shows that the Energy Policy Act of 1992 was followed by an increase in M&A activity (panel A) and an insignificant decrease in the Herfindahl-Hirschman index of industry concentration, coupled with a decrease in the number of public traded firms (panel B). Cash flow volatility rose temporarily in 1992, increased further in 1995 and then declined rapidly in 1996 (panel C). FERC order 888 of 1996 mandated the unbundling of electric utility services. This was followed by a dramatic rise in M&A activity and an increase in the Herfindahl-Hirschman index of industry concentration, coupled with a decrease in the number of public traded firms. In 1996 the FERC announced a new merger policy (order 592) designed not to impede the development of vibrant and competitive generation markets. The 1992 and 1996 deregulations enabled mergers and a more competitive utilities industry (higher cash flow volatility) without significantly increasing entry.

In the communication industry, the Telecommunications Act of 1996 opened both the longdistance and local phone markets to more competition from new communication technologies including fiber optic, cellular, cable and the internet. Figure 2.1c shows that the passage of the 1996 Act was followed by an increase in M&A activity (panel A) and an increase in the number of publicly traded firms, coupled with a sharp decrease in industry concentration (panel B). Cash flow volatility rose sharply in 1998 and remained at relatively high levels through 2001 (panel C). Inter-firm dispersion in ROS also increased after 1996 (panel D), indicating an increase in inter-firm dispersion in the quality of production technology.

In the banking industry, the Interstate Banking and Branching Efficiency (IBBEA) Act of 1994 repealed the interstate restrictions of the Bank Holding Company Act of 1956, which prohibited bank holding companies headquartered in one state from acquiring a bank in another state. Prior to the 1994 Act most states allowed interstate banking in some form. The watershed event of IBBEA was not the allowance of interstate banking but the explicit permission of interstate branching, which gave banking companies the freedom to consolidate bank subsidiaries into branch offices and to branch across state lines (Johnson and Rice, 2008).

Figure 2.1d shows that the passage of the IBBEA Act of 1994 occurred in the midst of an upward trend in both M&A activity (panel A) and the number of publicly listed banks (panel B) that can be traced to the beginning of the 1990s. This suggests that competitive forces had begun to impact the structure of the banking industry prior to the 1994 Act. Cash flow volatility (panel C) and inter-firm dispersion in ROS (panel D) had been on an upward trend in the late 1980s before peaking around 1991, following the decline in the value of commercial real estate and the 1990-1991 recession that weakened banking institutions. No dramatic increases in cash flow volatility or dispersion in ROS occur again until 1998, during the recent financial crisis.

In summary, the time-series patterns in Figures 2.1a through 2.1b indicate that deregulation in the 1990s facilitated merger activity and a more competitive industry environment. I test whether the associations between the increases in M&A activity and the increases in competition following the major deregulation events of the 1990s are indeed significant. Table 2.5 shows that the 5-year average of M&A count increased significantly after each major deregulation event in all four industries. The change in the 5-year average of the value (\$ billions in 2009 dollars) of M&A activity is significant in two industries, i.e. communication and banking. Table 2.5 also shows that, following each deregulation event (except for the 1992 deregulation in utilities), the increases in M&A activity are associated with significant increases in competition, measured using the 5-year averages of the number of new public listings (ENTRY), the Herfindahl-Hirschman index of industry concentration (HH INDEX) and the number of publicly listed firms (Number of Firms).

2.4.2 Univariate Analyses: "High-Tech" Industries

Technological changes are not readily identified with specific-time events and thus in this univariate setting I simply examine whether there are obvious patterns in the time-series of M&A activity and measures of industry competition. For brevity I focus my analysis on a representative set of "high-tech" industries, i.e. computer hardware, computer software, electronic equipment and pharmaceutical products. The patterns shown here for the above industries are similar to those (not shown here) exhibited by the other "high-tech" industries, i.e. medical equipment, aircraft, and measuring and control.

A first notable pattern in Panel A of Figures 2.2a through 2.2d is that M&A activity in these "high-tech" industries peaks around the end of the 1990s and the peaks correspond to the troughs in the Herfindahl-Hirschman index of industry concentration (panel D). M&A activity reached over \$130 billion in 1999 in the pharmaceutical industry, \$330 billion in 2000 in the computer software industry, \$115 billion in 2000 in the Electronic Equipment industry, and \$30 billion in 2001 in the Computer Hardware industry. The peaks in the computer software and electronic equipment industries coincide with the crash of the technology heavy Nasdaq stock market, which reached its climax in March, 2000. The run-up in the Nasdaq is attributed in part to the rapid commercial growth of the internet – record setting growth in start-up dot.com companies was aided by venture capital and IPOs – and investments in new communication and information technologies. These record investments contributed to substantial industry overcapacity and consolidation in 2000.

The peaks of the late 1990s merger activity also appear to have coincided with the peaks in inter-firm dispersion in both ROS and R&D scaled by assets (see panel B of each figure). Across all four industries and over the sample period, both measures of dispersion in the quality of production technology exhibit high positive correlations, ranging from 0.48 in the electronic equipment industry to 0.82 in the pharmaceutical products industry. This suggests that periods of high inter-firm dispersion in ROS are often periods of high inter-firm dispersion in the rate of R&D investment reflects the rate at which it adapts to new technology, then a period of high inter-firm dispersion in the rate of R&D investment reflects in the rate of R&D investment is likely to be a period of technological change because this is when inter-firm differences in the rate of adaptation to new technology is likely to be high.

But it is plausible that dispersion in ROS and dispersion in the rate of R&D investments are co-determined by the level of investment opportunities or the level of entry that might be unrelated to technological change. I plot in panel C of Figures 2.2a through 2.2d the time-series of the average rate of R&D investment against the level of competition, measured by either the Herfindahl-Hirschman index or the number of firms. There is a high negative correlation between average R&D scaled by assets and the Herfindahl-Hirschman index (computer hardware, -0.62; computer software, -0.87; electronic equipment, -0.80). For the pharmaceutical products industry the correlation between average R&D scaled by assets and the number of firms is a positive 0.88. The data suggests that technological changes play a role in the observed associations between M&A activity and competition in "high-tech" industries. I examine this further in a multivariate setting.
2.4.3 Multivariate Tests: Full-Sample

I employ fixed-effects regression model specifications for the multivariate tests. Table 2.6 shows the full sample results for the following regression equation with both year and industry fixed-effects.

$$M\&A_{jt} = b_0 + b_t ENTRY_{jt} + b_2 DISP CFLOW SHOCKS_{jt} + b_3 DISP ROS_{jt} + b_4 M/B_{jt} + \alpha_t + \lambda_j + \varepsilon_{jt}$$
(2.4)

Panel A, presents full-sample regression results with industry-year M&A activity measured by value (\$ billions in 2009 dollars) as the dependent variable, and Panel B shows the results with industry-year M&A activity measured by count as the dependent variable. Panel A shows a positive and significant association between industry M&A activity and ENTRY, indicating that the value of industry M&A activity increases with the level of entry. A one standard deviation increase in ENTRY increases industry M&A activity by \$3.96 billion.

There is also a positive and significant association between industry M&A activity and DISP CFLOW SHOCKS, the proxy for cash flow volatility. A one standard deviation increase in DISP CFLOW SHOCKS increases industry M&A activity by \$2.08 billion. The result from regression Model I shows that inter-firm dispersion in the quality of production technology, measured by DISP ROS, is positively but insignificantly associated with industry M&A activity. Model II substitutes DISP ROA for DISP ROS and the result is qualitatively similar. Model IV presents the result of the regression equation (2.4). Here, conditioning on market valuation (M/B) to control for variation in the business cycle, growth opportunities and potential misvaluation, the associations between ENTRY and industry M&A activity, and between DISP CFLOW SHOCKS and industry M&A activity, remain positive and significant.

The full sample result shows that industry M&A activity is positively associated with the level of entry and cash flow volatility. This economically and statistically significant result is consistent with the hypothesis that industry merger activity is positively associated with industry competition. Panel B of Table 2.6 shows the regression result with M&A activity measured by count as the dependent variable. Similar to the result in Panel A, the coefficient on ENTRY is positive and significant, but the coefficient on DISP CFLOW SHOCKS is insignificant. In addition, the coefficient on DISP ROS is negative and insignificant, indicating that the count of industry M&A activity increases as inter-firm dispersion in the quality of production technology decreases. In order to draw clearer inferences about the channels through which economic shocks from deregulated and "high-tech" industries.

2.4.4 Multivariate Tests: Deregulated and High-Tech Industries

I run one set of regressions for deregulated industries and another set for "high-tech" industries to determine whether the channels differ in their importance to deregulation and technological changes. The group of deregulated industries consists of industries – petroleum and natural gas, utilities, communication, banking and transportation – impacted by major deregulation events since the 1970s. The group of "high-tech" industries consists of industries – medical equipment, pharmaceutical, aircraft, computer hardware, computer software, electronic equipment, and measuring and control – classified as "high-tech" by the OECD (Organization for Economic Co-operation and Development) based on R&D intensity from 1999. The communication industry classifies as a "high-tech" industry but I have it treated as a deregulated industry for this analysis.

Panel A of Table 2.8 presents the regression results for the group of deregulated industries, with industry M&A activity measured by value. The result from regression Model IV indicates that

entry and cash flow volatility are important channels through which deregulation drives M&A activity. Here a one standard deviation increase in ENTRY increases industry M&A activity by \$6.70 billion. A one standard deviation increase in DISP CFLOW SHOCKS increases industry M&A activity by \$30.91 billion. This shows that the cash flow volatility channel plays an important role in how deregulation drives merger activity, and supports the notion that mergers provide an alternative means to exit via bankruptcy as cash flow volatility increases.

DISP ROS is negatively and significantly associated with industry M&A activity in deregulated industries. A one standard deviation decrease in DISP ROS increases industry M&A activity by \$19.16 billion. This is consistent with the observation made earlier in the banking industry that the increase in M&A activity following the 1994 deregulation is associated with a decline in DISP ROS. Regression Model V substitutes DISP R&D/ASSETS for DISP ROS to ensure an apples-to-apples comparison of the result for deregulated industries to the result for "high-tech" industries. I would note that much of the R&D data for firms in deregulated industries, unlike those for firms in "high-tech" industries, is unavailable/non-existent. In regression Model V, DISP R&D/ASSETS, as well as ENTRY, is not significantly associated with industry M&A activity.

Panel B of Table 2.8 presents the regression results for the deregulated industries, with industry M&A activity measured by count. Regression Model IV shows a positive and significant association between ENTRY and industry M&A count. A one standard deviation increase in ENTRY increases industry M&A count by 9.32. The association between DISP ROS and industry M&A count is negative and significant. A one standard deviation decrease in DISP ROS increases industry M&A count by 12.6. In regression Model V, DISP R&D/ASSETS is not significantly associated with industry M&A count.

Table 2.9 Panel A presents the regression result for the "high-tech" industries, with industry M&A activity measured by value as the dependent variable. The level of entry is positively and significantly associated with industry M&A activity in "high-tech" industries. A one standard deviation increase in ENTRY increases industry M&A activity by \$9.04 billion. Cash flow volatility is not significantly associated with industry M&A activity. Regression Model IV result shows that, unlike the result for the deregulated industries, DISP ROS and industry M&A activity are positively and significantly associated. This supports the notion that technological changes drive industry merger activity by increasing inter-firm dispersion in the quality of production technology. To test the robustness of this result, Model V substitutes DISP R&D/ASSETS for DISP ROS. Here, a one standard deviation increase in DISP R&D/ASSETS increases industry M&A activity by \$17.15 billion.

Table 2.9 Panel B presents the regression result for the "high-tech" industries, with industry M&A activity measure by count. Here, industry M&A count is positively and significantly associated with both ENTRY and DISP R&D/ASSETS. A one standard deviation increase in ENTRY increases industry M&A count by 3.37; a one standard deviation increase in DISP R&D/ASSETS increases industry M&A count by 6.26. Cash flow volatility is not significantly associated with industry M&A count.

In summary, the results indicate that the channels differ in their importance to deregulation and technological changes. Deregulation drives merger activity by increasing entry and cash flow volatility. Technological changes, on the other hand, drive merger activity by increasing entry and inter-firm dispersion in the quality of production technology.

2.5. Conclusion

Merger activity tends to cluster within a few industries during periods of high aggregate merger activity. Prior research provides strong empirical evidence linking the industry-level clustering of merger activity in the 1980s and 1990s to changes to industry structure brought about by economic shocks from deregulation (Mitchell and Mulherin, 1996; Mulherin and Boone, 2000; Andrade et al., 2001). Jovanovich and Rousseau (2002) use a Q-theory model of mergers to show that the merger waves of the 1980s and 1990s were a response to profitable reallocation opportunities attributable to economic shocks from technological changes. But what is less understood is the mechanism through which economic shocks from deregulation and technological changes drive merger activity.

In this paper, I investigate the role of the competitive mechanism in how economic shocks from deregulation and technological changes drive merger activity, controlling for the effect of valuations. I show that these shocks drive merger activity through three potential channels that differ in their importance to deregulation and technological changes. Deregulation drives merger activity by increasing entry and cash flow volatility. Technological changes drive merger activity by increasing entry and inter-firm dispersion in the quality of production technology. The evidence underscores the role of the competitive mechanism in how managers reallocate assets to more efficient uses via mergers. These inferences can be extended to other sources of economic shocks such as industry overcapacity, financing innovations, globalization, international trade, demand shocks and input costs shocks that also have the potential to induce a more competitive environment.

Table 2.1: Summary Descriptive Statistics of M&A Sample, 1980 – 2009

This table presents summary descriptive statistics of the SDC M&A sample from 1980 to 2009, involving public acquirers and public U.S. targets. Statistics for the full sample and for sub-samples by decade are reported, by count and by value (\$ billions in 2009 dollars) of the deals.

	Total	1980s	1990s	2000s
Panel A: Count				
Sum	6,943.00	1,395.00	3,163.00	2,385.00
Mean	4.82	2.91	6.59	4.97
Median	2.00	1.00	2.00	2.00
Max	*146.00	51.00	*146.00	89.00
Min	0.00	0.00	0.00	0.00
Panel B: Value (\$ billions)				
Sum	\$9,096.91	\$866.57	\$4,031.27	\$4,199.07
Mean	\$6.32	\$1.81	\$8.40	\$8.75
Median	\$0.54	\$0.26	\$0.74	\$1.09
Max	**\$397.89	\$36.90	**\$397.89	\$333.16
Min	\$0.00	\$0.00	\$0.00	\$0.00

*Maximum industry-year observation (count) occurred in Banking in 1997.

**Maximum industry-year observation (value) occurred in Communications in 1999.

Table 2.2: Top 10 Industries by M&A Deal Value (% of Total) by Decade

This table presents a ranking of the top 10 industries in each decade by value of M&A deals. The ranking is based on total value of M&A deals recorded for each industry in each decade as a percentage of the total M&A deals recorded in the respective decade.

Rank	1980s	1990s	2000s
1.	Banking (12%)*	Communication (24%)***	Banking (17%)*
2.	Petroleum & Nat. Gas (8%)*	Banking (15%)*	Computer Software (11%)**
3.	Pharmaceuticals (8%)**	Insurance (7%)	Pharmaceuticals (9%)**
4.	Chemicals (7%)	Petroleum & Nat. Gas (6%)*	Petroleum & Nat. Gas (8%)*
5.	Printing & Publishing (4%)	Pharmaceuticals (5%)**	Communications (8%)***
6.	Communication (4%)***	Utilities (5%)*	Insurance (5%)
7.	Retail (4%)	Trading (5%)	Electronic Equipment (5%)**
8.	Consumer Goods (4%)	Chemicals (4%)	Trading (5%)
9.	Steel Works (4%)	Retail (3%)	Computer Hardware (3%)**
10.	Utilities (4%)*	Computer Software (3%)**	Utilities (3%)*

*Deregulated industry.

**High-tech industry.

***Communication classifies as both a deregulated and high-tech industry.

Table 2.3a: Summary Statistics of Industry-year Variables

This table presents summary statistics for the proxy variables employed in the study based on industry-year data. The industry-year data is computed from firm-year observations. ENTRY is the count of new CRSP listed firms (share code 10 & 11). Number of Firms is the count of CRSP listed firms (share code 10 & 11). HH INDEX is Herfindahl-Hirschman index of industry concentration, the sum of the squared market shares (sales over total industry sales) of firms in an industry in a given year based on data from CRSP/Compustat merged file. DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is the cross-sectional standard deviation of the return on assets (cash flow/assets). To compute DISP ROS and DISP ROA I exclude firm-year observations where ROS or ROA is greater than 1 or less than -1, in order to remove the influence of extreme values. AVG R&D/ASSETS is the median R&D scaled by assets. DISP R&D/ASSETS is the cross sectional standard deviation of R&D scaled by assets. M/B is the mean market-to-book equity ratio (in natural logs) for each industry-year.

	Mean	Median	Max	Min	Std. Dev.	Obs.
ENTRY	10.00	4.00	167.00	0.00	16.51	1440
Number of Firms	117.71	80.00	873.00	4.00	121.34	1440
HH INDEX	0.14	0.09	0.97	0.01	0.15	1440
DISP CFLOW SHOCK	0.14	0.09	2.84	0.00	0.21	1440
DISP ROS	0.17	0.15	0.45	0.02	0.08	1440
DISP ROA	0.12	0.12	0.37	0.01	0.05	1440
AVG R&D/ASSETS	0.01	0.00	0.13	0.00	0.03	1440
DISP R&D/ASSETS	0.03	0.02	0.24	0.00	0.03	1440
M/B (log)	0.41	0.41	1.73	-1.10	0.43	1440

Table 2.3b: Correlation Coefficients of Industry-year Variables

This table presents correlation coefficients for the proxy variables employed in the study based on industry-year observations. The industry-year data is computed from firm-year observations. ENTRY is the count of new CRSP listed firms (share code 10 & 11). HH INDEX is Herfindahl-Hirschman index of industry concentration, the sum of the squared market shares (sales over total industry sales) of firms in an industry in a given year based on data from CRSP/Compustat merged file. DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is the cross-sectional standard deviation of the return on assets (cash flow/sales). To compute DISP ROS and DISP ROA I exclude firm-year observations where ROS or ROA is greater than 1 or less than -1, in order to remove the influence of extreme values. AVG R&D/ASSETS is the median R&D scaled by assets. DISP R&D/ASSETS is the cross sectional standard deviation of R&D scaled by assets. M/B is the mean market-to-book equity ratio (in natural logs) for each industry-year.

	ENTRY	HH INDEX	DISP CFLOW	DISP	DISP	AVG	DISP	M/B
			SHOCK	ROS	ROA	R&D/ASSETS	R&D/ASSETS	(log)
ENTRY	1.00							
HH INDEX	-0.21	1.00						
DISP CFLOW SHOCK	0.00	0.00	1.00					
DISP ROS	0.25	-0.08	0.10	1.00				
DISP ROA	0.12	0.02	0.05	0.52	1.00			
AVG R&D/ASSETS	0.21	-0.08	-0.05	0.20	0.41	1.00		
DISP R&D/ASSETS	0.21	-0.08	-0.06	0.22	0.49	0.82	1.00	
M/B (log)	0.29	0.01	-0.15	0.28	0.42	0.42	0.44	1.00

Table 2.4: Averages of Industry-year M&A Activity and Descriptive Variables, 1980 - 2009

This table presents the averages (means) of industry-year M&A activity, by count and by value (\$ billion in 2009 dollars), and descriptive variables. ENTRY is the count of new CRSP listed firms (share code 10 & 11). Number of Firms is the average count of CRSP listed firms (share code 10 & 11). HH INDEX is the average Herfindahl-Hirschman index of industry concentration computed from the sum of the squared market shares (sales over total industry sales) of firms for each industry-year. ROS is the average return on sales (cash flow/sales) computed from the median return on sales for each industry-year using Compustat data. R&D/ASSETS is the average R&D scaled by book assets computed from the median R&D scaled by assets for each industry-year using Compustat data. Missing firm-level R&D observations are replaced with zero. M/B is the average market-to-book equity ratio computed from the mean market-to-book equity ratio (in natural logs) for each industry-year.

	Industry	M&A	M&A	ENTRY	Number	HH INDEX	ROS	R&D/ASSETS	M/B (log)
		(count)	(Value)		of Firms				
1	Agriculture	0.33	0.08	1.77	16.40	0.42	0.05	0.00	0.27
2	Food Products	2.57	2.93	4.93	81.67	0.06	0.08	0.00	0.49
3	Candy and Soda	0.53	1.88	0.50	11.70	0.18	0.14	0.00	0.40
4	Beer and Liquor	0.43	2.33	1.13	15.77	0.22	0.14	0.00	-0.15
5	Tobacco Products	0.23	1.66	0.40	5.70	0.34	0.17	0.00	0.17
6	Recreation	1.50	1.67	3.97	48.90	0.34	0.09	0.02	0.24
7	Entertainment	2.53	3.76	10.10	82.00	0.19	0.18	0.00	0.68
8	Printing and Publishing	1.80	3.39	3.53	53.07	0.08	0.16	0.00	0.53
9	Consumer Goods	3.30	4.43	5.03	94.13	0.09	0.10	0.01	0.34
10	Apparel	1.17	0.67	3.53	68.53	0.06	0.08	0.00	0.14
11	Healthcare	4.47	3.95	14.40	117.47	0.09	0.11	0.00	0.83
12	Medical Equipment	5.43	3.79	16.93	167.77	0.11	0.11	0.05	1.07
13	Pharmaceutical Products	10.07	21.27	21.60	229.43	0.06	0.11	0.07	1.21
14	Chemicals	3.37	8.50	5.53	92.10	0.08	0.13	0.02	0.46
15	Rubber and Plastic Products	0.93	0.47	3.40	52.40	0.14	0.10	0.00	0.46
16	Textiles	0.77	0.20	1.97	38.57	0.11	0.10	0.00	-0.08
17	Construction Materials	2.43	1.62	4.67	117.07	0.05	0.11	0.00	0.20
18	Construction	1.77	1.42	4.90	65.90	0.05	0.07	0.00	0.16
19	Steel Works Etc.	2.80	3.54	3.70	74.57	0.06	0.10	0.00	-0.07
20	Fabricated Products	0.23	0.07	1.03	22.73	0.14	0.10	0.00	0.40
21	Machinery	5.40	4.71	9.23	183.30	0.05	0.10	0.02	0.44
22	Electrical Equipment	1.53	1.80	10.67	112.23	0.14	0.09	0.05	0.63

23	Automobiles and Trucks	2.17	3.71	3.90	76.57	0.13	0.09	0.01	0.03
24	Aircraft	1.37	2.87	1.37	26.30	0.22	0.12	0.01	0.34
25	Ship Building and Rail Equipment	0.20	0.05	0.60	8.03	0.52	0.08	0.00	0.63
26	Defense	0.43	0.99	0.60	10.23	0.46	0.12	0.02	0.70
27	Precious Metals	1.17	0.84	2.87	31.40	0.16	0.19	0.00	0.47
28	Non-Metal and Metal Mining	0.83	1.91	1.70	21.47	0.16	0.19	0.00	0.12
29	Coal	0.07	0.05	0.70	9.00	0.55	0.12	0.00	0.31
30	Petroleum and Natural Gas	8.30	21.17	21.87	250.67	0.06	0.26	0.00	0.48
31	Utilities	5.13	11.60	3.47	172.37	0.02	0.25	0.00	0.19
32	Communication	9.67	44.36	18.87	142.63	0.10	0.24	0.00	0.45
33	Personal Services	1.27	0.30	7.00	64.77	0.12	0.13	0.00	0.71
34	Business Services	8.27	4.25	31.43	290.93	0.34	0.11	0.00	0.77
35	Computer Hardware	5.60	6.44	14.00	145.83	0.14	0.09	0.09	0.78
36	Computer Software	16.93	19.69	40.30	283.90	0.10	0.09	0.09	1.01
37	Electronic Equipment	10.17	10.11	20.40	284.97	0.05	0.10	0.06	0.62
38	Measuring and Control Equipment	3.60	1.56	7.93	120.90	0.10	0.10	0.07	0.66
39	Business Supplies	1.80	3.64	2.70	60.13	0.06	0.12	0.00	0.29
40	Shipping Containers	0.40	0.21	1.13	19.17	0.13	0.11	0.00	-0.24
41	Transportation	3.43	2.70	9.57	118.63	0.04	0.13	0.00	0.23
42	Wholesale	4.47	3.59	19.50	233.40	0.04	0.05	0.00	0.37
43	Retail	6.77	8.00	22.53	281.70	0.04	0.06	0.00	0.38
44	Restaurants, Hotels, Motels	3.40	2.64	11.30	124.43	0.06	0.11	0.00	0.54
45	Banking	58.73	47.05	57.97	566.13	0.03	0.26	0.00	0.07
46	Insurance	7.70	17.02	10.53	177.87	0.05	0.12	0.00	0.19
47	Real Estate	1.13	1.30	4.70	57.30	0.14	0.16	0.00	0.26
48	Trading	14.83	13.03	29.90	319.90	0.06	0.28	0.00	0.32

Figure 2.1a: Petroleum and Natural Gas Industry M&A Activity and Proxy Variables, 1980 - 2009



Figure 2.1b: Utilities Industry M&A Activity and Proxy Variables, 1980 - 2009



Figure 2.1c: Communication Industry M&A Activity and Proxy Variables, 1980 - 2009



Figure 2.1d: Banking Industry M&A Activity and Proxy Variables, 1980 – 2009



Table 2.5: Deregulation, M&A Activity and Entry Activity

This table presents 5-year averages, before and after deregulation events of the 1990s, for measures of M&A activity, by count and by value (billions in 2009 dollars), and measures of changes to industry competition. ENTRY is the count of new CRSP listed firms (share code 10 & 11). Number of Firms is the count of CRSP listed firms (share code 10 & 11). HH INDEX is the Herfindahl-Hirschman index of industry concentration, measured as the squared sum of the market shares in sales of the firms in an industry based on data from the CRSP/Compustat merged data file. % Change column shows the percentage changes in the 5-year averages of the measures from before deregulation to after deregulation. *t*(diff) measures the statistical significance of the changes.

	5-Year Averages				
	Before	After	% Change	<i>t</i> (diff)	
Petroleum and Natural Gas (1992)					
M&A (count)	4.80	11.20	133%	2.20	
M&A (\$ billion)	2.24	6.28	180%	1.17	
ENTRY	16.60	19.00	14%	0.37	
Number of Firms	233.00	243.80	5%	2.57	
HH INDEX	0.07	0.06	-15%	-6.96	
Utilities (1992)					
M&A (count)	3.40	7.40	118%	2.48	
M&A (\$ billion)	2.38	11.51	384%	1.40	
ENTRY	3.00	4.20	40%	1.50	
Number of Firms	194.60	189.60	-3%	-2.99	
HH INDEX	0.02	0.01	-7%	-0.93	
Communications (1996)					
M&A (count)	8.80	25.20	186%	5.28	
M&A (\$ billion)	17.03	188.60	1007%	2.79	
ENTRY	22.40	39.00	74%	2.94	
Number of Firms	153.40	211.20	38%	8.93	
HH INDEX	0.07	0.04	-43%	-18.29	
Banking (1994)					
M&A (count)	53.00	119.00	125%	6.46	
M&A (\$ billion)	15.16	94.12	521%	2.04	
ENTRY	52.00	107.00	106%	3.42	
Number of Firms	558.80	775.60	39%	15.88	
HH INDEX	0.03	0.02	-30%	-2.82	

Figure 2.2a: Computer Hardware Industry M&A Activity and Proxy Variables, 1980 - 2009

Panel A plots the time-series of M&A activity by value (solid line) and by count (dashed line). Panel B plots the time-series of DISP ROS (solid line), the crosssectional standard deviation of the return on sales (cash flow/sales), and DISP R&D/ASSETS (dashed line), the cross-sectional standard deviation of R&D scaled by book assets. Panel C plots the time-series of HH INDEX (solid line), the Herfindahl-Hirschman index of industry concentration, and AVG R&D/ASSETS (dashed line), the median R&D scaled by book assets. Panel D plots the time series of HH INDEX (solid line) and Number of Firms (dashed line) listed on CRSP.



Figure 2.2b: Computer Software Industry M&A Activity and Proxy Variables, 1980 - 2009

Panel A plots the time-series of M&A activity by value (solid line) and by count (dashed line). Panel B plots the time-series of DISP ROS (solid line), the crosssectional standard deviation of the return on sales (cash flow/sales), and DISP R&D/ASSETS (dashed line), the cross sectional standard deviation of R&D scaled by book assets. Panel C plots the time-series of HH INDEX (solid line), the Herfindahl-Hirschman index of industry concentration, and AVG R&D/ASSETS (dashed line), the median R&D scaled by book assets. Panel D plots the time series of HH INDEX (solid line) and Number of Firms (dashed line) listed on CRSP.



Figure 2.2c: Electronic Equipment Industry M&A Activity and Proxy Variables, 1980 - 2009

Panel A plots the time-series of M&A activity by value (solid line) and by count (dashed line). Panel B plots the time-series of DISP ROS (solid line), the crosssectional standard deviation of the return on sales (cash flow/sales), and DISP R&D/ASSETS (dashed line), the cross sectional standard deviation of R&D scaled by book assets. Panel C plots the time-series of HH INDEX (solid line), the Herfindahl-Hirschman index of industry concentration, and AVG R&D/ASSETS (dashed line), the median R&D scaled by book assets. Panel D plots the time series of HH INDEX (solid line) and Number of Firms (dashed line) listed on CRSP.



Figure 2.2d: Pharmaceutical Products Industry M&A Activity and Proxy Variables, 1980 - 2009

Panel A plots the time-series of M&A activity by value (solid line) and by count (dashed line). Panel B plots the time-series of DISP ROS (solid line), the crosssectional standard deviation of the return on sales (cash flow/sales), and DISP R&D/ASSETS (dashed line), the cross-sectional standard deviation of R&D scaled by book assets. Panel C plots the time-series of AVG R&D/ASSETS (solid line), the median R&D scaled by book assets, and Number of Firms (dashed line). Panel D plots the time series of HH INDEX (solid line), the Herfindahl-Hirschman index of industry concentration, and Number of Firms (dashed line) listed on CRSP.



Table 2.6: Fixed-Effects Regression Analysis for Full Sample of 48 Industries

This table presents the results from regressions of industry-year M&A activity, by value (\$ billions in 2009 dollars) and by count, on explanatory variables for the 1980 to 2009 full sample period. All regression models include year and industry fixed-effects. ENTRY is the count of new CRSP listed firms (share code 10 & 11). DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of the return on assets (ROA, cash flow/assets). To compute DISP ROS and DISP ROA I exclude firm-year observations where ROS or ROA is greater than 1 or less than -1, in order to remove the influence of extreme values. M/B is the natural log of industry market-to-book equity ratio, the mean of the individual firm-year observations. Statistical significance at the 1% and 5% levels are denoted by *** and **, respectively.

Panel A: Dependent V ariable = M	l&A (V alue)				
Explanatory Variables	Model I	Model II	Model III	Model IV	
ENTRY	0.26***	0.26***		0.24***	
	(5.42)	(5.46)		(4.95)	
DISP CFLOW SHOCKS	9.60***	9.74***		9.92***	
	(5.04)	(5.12)		(5.18)	
DISP ROS	17.36			15.33	
	(1.38)			(1.21)	
DISP ROA		15.48			
		(0.93)			
M/B			4.81**	3.29	
			(2.37)	(1.59)	
Constant	0.27	3.51	11.44	0.18	
	(0.05)	(0.71)	(2.49)	(0.03)	
R-Square	0.31	0.31	0.29	0.32	
Observations	1440	1440	1440	1440	
Panel B: Dependent Variable = M	&A (Count)				
Explanatory Variables	Model I	Model II	Model III	Model IV	
ENTRY	0.17***	0.17***		0.16***	
	(11.44)	(11.28)		(10.69)	
DISP CFLOW SHOCK	0.56	0.44		0.70	
	(0.94)	(0.74)		(1.17)	
DISP ROS	-11.29***			-12.18***	
	(-2.89)			(-3.10)	
DISP ROA		-1.96			
		(-0.38)			
M/B			2.68***	1.44**	
			(4.15)	(2.25)	
Constant	12.05	9.08	11.73	12.01	
	(6.68)	(5.92)	(8.04)	(6.67)	
R-Square	0.72	0.72	0.69	0.72	
Observations	1440	1440	1440	1440	

Panel A: Dependent Variable = $Mc^{\circ}A$ (Value)

Table 2.7a: Summary Statistics of Industry-year Variables by Industry Group

This table presents summary statistics of industry-year observations for M&A activity, by count and by value (\$ billions in 2009 dollars), and for proxy variables used in industry group sub-sample regressions, for the 1980 to 2009 sample period. ENTRY is the count of new CRSP listed firms (share code 10 & 11). Number of Firms is the count of CRSP listed firms (share code 10 & 11). HH INDEX is Herfindahl-Hirschman index of industry concentration, the sum of the squared market shares (sales over total industry sales) of firms in an industry in a given year. DISP CFLOW SHOCK is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is the cross-sectional standard deviation of the return on assets (cash flow/sales). To compute DISP ROS and DISP ROA I exclude firm-year observations where ROS or ROA is greater than 1 or less than -1, in order to remove the influence of extreme values. AVG R&D/ASSETS is the median R&D scaled by assets. DISP R&D/ASSETS is the cross sectional standard deviation of R&D scaled by assets. M/B is the natural log of the market-to-book equity ratio, the mean of the individual firm-year observations.

Deregulated Industries	Mean	Median	Max	Min	Std. Dev.	Obs.
M&A (count)	17.05	6.00	*146.00	0.00	26.78	150
M&A (\$ billions)	25.38	5.96	**397.89	0.00	52.31	150
ENTRY	22.35	12.00	151.00	0.00	29.13	150
Number of Firms	250.09	189.00	873.00	63.00	192.19	150
HH INDEX	0.05	0.04	0.33	0.01	0.05	150
DISP CFLOW SHOCK	0.17	0.10	1.99	0.02	0.25	150
DISP ROS	0.21	0.19	0.38	0.10	0.08	150
DISP ROA	0.09	0.09	0.19	0.03	0.04	150
AVG R&D/ASSETS	0.00	0.00	0.00	0.00	0.00	150
DISP R&D/ASSETS	0.01	0.00	0.08	0.00	0.01	150
M/B (log)	0.28	0.29	1.59	-0.80	0.38	150
"High-Tech" Industries	Mean	Median	Max	Min	Std. Dev.	Obs.
"High-Tech" Industries M&A (count)	Mean 7.60	Median 5.00	Max ***60.00	Min 0.00	Std. Dev. 9.11	Obs. 210
"High-Tech" Industries M&A (count) M&A (\$ billions)	Mean 7.60 9.39	Median 5.00 1.68	Max ***60.00 ***333.16	Min 0.00 0.00	Std. Dev. 9.11 22.28	Obs. 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY	Mean 7.60 9.39 17.50	Median 5.00 1.68 13.00	Max ***60.00 ***333.16 167.00	Min 0.00 0.00 0.00	Std. Dev. 9.11 22.28 21.03	Obs. 210 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms	Mean 7.60 9.39 17.50 179.87	Median 5.00 1.68 13.00 165.50	Max ***60.00 ***333.16 167.00 613.00	Min 0.00 0.00 0.00 22.00	Std. Dev. 9.11 22.28 21.03 113.05	Obs. 210 210 210 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms HH INDEX	Mean 7.60 9.39 17.50 179.87 0.11	Median 5.00 1.68 13.00 165.50 0.10	Max ***60.00 ***333.16 167.00 613.00 0.39	Min 0.00 0.00 0.00 22.00 0.03	Std. Dev. 9.11 22.28 21.03 113.05 0.07	Obs. 210 210 210 210 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms HH INDEX DISP CFLOW SHOCK	Mean 7.60 9.39 17.50 179.87 0.11 0.11	Median 5.00 1.68 13.00 165.50 0.10 0.07	Max ***60.00 ***333.16 167.00 613.00 0.39 1.22	Min 0.00 0.00 0.00 22.00 0.03 0.02	Std. Dev. 9.11 22.28 21.03 113.05 0.07 0.12	Obs. 210 210 210 210 210 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms HH INDEX DISP CFLOW SHOCK DISP ROS	Mean 7.60 9.39 17.50 179.87 0.11 0.11 0.21	Median 5.00 1.68 13.00 165.50 0.10 0.07 0.20	Max ***60.00 ***333.16 167.00 613.00 0.39 1.22 0.39	Min 0.00 0.00 22.00 0.03 0.02 0.05	Std. Dev. 9.11 22.28 21.03 113.05 0.07 0.12 0.07	Obs. 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms HH INDEX DISP CFLOW SHOCK DISP ROS DISP ROA	Mean 7.60 9.39 17.50 179.87 0.11 0.11 0.21 0.17	Median 5.00 1.68 13.00 165.50 0.10 0.07 0.20 0.17	Max ***60.00 ***333.16 167.00 613.00 0.39 1.22 0.39 0.26	Min 0.00 0.00 22.00 0.03 0.02 0.05 0.05	Std. Dev. 9.11 22.28 21.03 113.05 0.07 0.12 0.07 0.04	Obs. 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms HH INDEX DISP CFLOW SHOCK DISP ROS DISP ROA AVG R&D/ASSETS	Mean 7.60 9.39 17.50 179.87 0.11 0.11 0.21 0.17 0.06	Median 5.00 1.68 13.00 165.50 0.10 0.07 0.20 0.17 0.07	Max ***60.00 ***333.16 167.00 613.00 0.39 1.22 0.39 0.26 0.13	Min 0.00 0.00 22.00 0.03 0.02 0.05 0.05 0.00	Std. Dev. 9.11 22.28 21.03 113.05 0.07 0.12 0.07 0.04 0.03	Obs. 210
"High-Tech" Industries M&A (count) M&A (\$ billions) ENTRY Number of Firms HH INDEX DISP CFLOW SHOCK DISP ROS DISP ROA AVG R&D/ASSETS DISP R&D/ASSETS	Mean 7.60 9.39 17.50 179.87 0.11 0.11 0.21 0.17 0.06 0.21	Median 5.00 1.68 13.00 165.50 0.10 0.07 0.20 0.17 0.07 0.20	Max ***60.00 ***333.16 167.00 613.00 0.39 1.22 0.39 0.26 0.13 0.39	Min 0.00 0.00 22.00 0.03 0.02 0.05 0.05 0.00 0.05	Std. Dev. 9.11 22.28 21.03 113.05 0.07 0.12 0.07 0.04 0.03 0.07	Obs. 210

*Banking in 1997.

**Communications in 1999.

***Computer Software in 2000.

Table 2.7b: Correlation Coefficients of Industry-year Variables by Industry Group

This table presents correlation coefficients for the proxy variables employed in the study based on industry-year observations. The industry-year data is computed from firm-year observations. ENTRY is the count of new CRSP listed firms (share code 10 & 11).HH INDEX is Herfindahl-Hirschman index of industry concentration, the sum of the squared market shares (sales over total industry sales) of firms in an industry in a given year based on data from CRSP/Compustat merged file. DISP ROS is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is greater than 1 or less than -1, in order to remove the influence of extreme values. AVG R&D/ASSETS is the median R&D scaled by assets. DISP R&D/ASSETS is the cross sectional standard deviation of R&D scaled by assets. DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. M/B is the mean market-to-book equity ratio (in natural logs) for each industry-year.

Deregulated Industries	ENTRY	HH INDEX	DISP CFLOW	DISP	DISP	AVG	DISP	M/B
			SHOCK	ROS	ROA	R&D/ASSETS	R&D/ASSETS	(log)
ENTRY	1.00							
HH INDEX	-0.05	1.00						
DISP CFLOW SHOCK	0.02	0.02	1.00					
DISP ROS	0.03	0.28	0.40	1.00				
DISP ROA	-0.11	0.32	0.34	0.71	1.00			
AVG R&D/ASSETS						1.00		
DISP R&D/ASSETS	-0.02	0.11	0.25	0.43	0.61		1.00	
M/B (log)	0.15	0.34	-0.06	0.25	0.28		-0.12	1.00
"High-Tech" Industries	ENTRY	HH INDEX	DISP CFLOW	DISP	DISP	AVG	DISP	M/B
			SHOCK	ROS	ROA	R&D/ASSETS	R&D/ASSETS	(log)
ENTRY	1.00							
HH INDEX	-0.33	1.00						
DISP CFLOW SHOCK	-0.02	-0.03	1.00					
DISP ROS	0.34	-0.58	0.01	1.00				
DISP ROA	0.36	-0.39	0.19	0.77	1.00			
AVG R&D/ASSETS	0.37	-0.62	0.17	0.54	0.59	1.00		
DISP R&D/ASSETS	0.38	-0.66	0.17	0.70	0.66	0.81	1.00	
M/B (log)	0.55	-0.45	-0.23	0.67	0.58	0.43	0.50	1.00

Table 2.8: Fixed-Effects Regression Analysis for Deregulated Industries

This table presents the results from sub-sample, by industry group, regressions of industry-year M&A activity, by value (\$ billions in 2009 dollars) and by count, on explanatory variables for the sample period from 1980 to 2009. All regression models include year and industry fixed-effects. ENTRY is the count of new CRSP listed firms (share code 10 & 11). DISP CFLOW SHOCKS is the cross-sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is the cross-sectional standard deviation of the return on assets (cash flow/assets). To compute DISP ROS I exclude firm-year observations where ROS is greater than 1 or less than -1, in order to remove the influence of extreme values. DISP R&D/AASETS is the cross- sectional standard deviation of R&D scaled by assets. M/B is the natural log of industry mean market-to-book equity ratio. Statistical significance at the 1% and 5% levels are denoted by *** and **, respectively.

Panel A: Dependent V ariable	$= M \mathfrak{O} A (V alue)$)			
Explanatory Variables	Model I	Model II	Model III	Model IV	Model V
ENTRY	0.37***	0.40***		0.23*	0.18
	(2.76)	(2.82)		(1.69)	(1.13)
DISP CFLOW SHOCKS	120.88***	106.96***		123.65***	107.97***
	(8.93)	(8.42)		(9.51)	(8.68)
DISP ROS	-236.23***			-239.49***	
	(-2.89)			(-3.05)	
DISP R&D/ASSETS		-798.96*			27.20
		(-1.95)			(0.05)
M/B			28.95**	29.63***	29.70**
			(2.56)	(3.32)	(2.45)
Constant	38.10	-3.77	41.39	50.01	7.58
	(1.76)	(-0.23)	(2.13)	(2.37)	(0.45)
R-Square	0.73	0.72	0.54	0.75	0.73
Observations	150	150	150	150	150
Panel B: Dependent Variable	= M&A (Count)				
Explanatory Variables	Model I	Model II	Model III	Model IV	Model V
ENTRY	0.35***	0.34***		0.32***	0.31***
	(6.58)	(5.77)		(5.77)	(4.51)
DISP CFLOW SHOCK	7.64	-2.12		8.21	-2.00
	(1.44)	(-0.40)		(1.56)	(-0.37)
DISP ROS	-156.85***			-157.51***	
	(-4.90)			(-4.96)	
DISP R&D/ASSETS		-253.70			-157.98
		(-1.48)			(-0.70)
M/B			11.92***	6.03*	3.44
			(2.91)	(1.67)	(0.66)
Constant	63.07	35.27	49.49	65.50	36.59
	(7.43)	(5.12)	(7.04)	(7.66)	(5.09)
R-Square	0.84	0.81	0.77	0.84	0.81
Observations	150	150	150	150	150

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Table 2.9: Fixed-Effects Regression Analysis for "High-Tech" Industries

This table presents the results from sub-sample, by industry group, regressions of industry-year M&A activity, by value (\$ billions in 2009 dollars) and by count, on explanatory variables for the sample period from 1980 to 2009. All regression models include year and industry fixed-effects. ENTRY is the count of new CRSP listed firms (share code 10 & 11). DISP CFLOW SHOCKS is the cross-sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of the return on sales (cash flow/sales). DISP ROA is the cross-sectional standard deviation of the return on assets (cash flow/assets). To compute DISP ROS I exclude firm-year observations where ROS is greater than 1 or less than -1, in order to remove the influence of extreme values. DISP R&D/AASETS is the cross- sectional standard deviation of R&D scaled by assets. M/B is the natural log of industry mean market-to-book equity ratio. Statistical significance at the 1% and 5% levels are denoted by *** and **, respectively.

Panel A: Dependent Variable	= M&A (Value)				
Explanatory Variables	Model I	Model II	Model III	Model IV	Model V
ENTRY	0.30**	0.33***		0.41***	0.43***
	(2.41)	(2.70)		(3.08)	(3.24)
DISP CFLOW SHOCKS	-0.09	-2.61		-6.33	-7.33
	(-0.01)	(-0.14)		(-0.35)	(-0.40)
DISP ROS	115.08*			130.10**	
	(1.82)			(2.06)	
DISP R&D/ASSETS		259.26*			245.05*
		(1.86)			(1.77)
M/B			-7.67	-27.68**	-23.60*
			(-0.65)	(-2.19)	(1.87)
Constant	-5.29	-2.03	17.86	7.66	12.47
	(-0.33)	(-0.14)	(1.45)	(0.45)	(0.76)
R-Square	0.36	0.36	0.32	0.38	0.37
Observations	210	210	210	210	210
Panel B: Dependent Variable	= M&A (Count)				
Explanatory Variables	Model I	Model II	Model III	Model IV	Model V
ENTRY	0.13***	0.13***		0.16***	0.16***
	(4.45)	(4.45)		(5.13)	(5.09)
DISP CFLOW SHOCK	2.71	0.80		1.03	-0.58
	(0.64)	(0.19)		(0.25)	(-0.14)
DISP ROS	-0.38			3.67	
	(-0.03)			(0.25)	
DISP R&D/ASSETS		93.60***			89.43***
		(2.92)			(2.82)
M/B			-1.39	-7.45**	-6.92**
			(-0.49)	(-2.50)	(-2.39)
Constant	4.32	-2.48	4.02	7.80	1.77
	(1.14)	(-0.74)	(1.35)	(1.97)	(0.47)
R-Square	0.66	0.67	0.61	0.67	0.68
Observations	210	210	210	210	210

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CHAPTER 3

DEREGULATION, COMPETITION AND MERGER ACTIVITY IN THE U.S. TELECOMMUNICATIONS INDUSTRY

3.1 Introduction

Why mergers involving publicly traded firms cluster at the industry-level has preoccupied researchers for the last couple of decades. The primary motivation for this study is a desire to better understand the role that efficiency plays in this industry-level clustering of merger activity. The merger literature presents a number of alternative theories on the drivers of merger activity. The imperfection in proxy variables and ambiguity in relative valuation measures such as market-to-book (M/B) inhibit efforts to contrast alternative theories on the drivers of merger activity, particularly in multi-industry studies. Multi-industry studies allow for macro-level inferences, but given that there are many proxy variables and there may be different things occurring in different industries at the same time, a single industry study allows for a more focused contrast of alternative theories. This study of the telecommunications industry provides more empirical detail on how economic shocks from deregulation and technological changes drive merger activity and contrasts the economic shocks and misvaluation theories of merger activity.

I take advantage of a "natural experiment" provided by the 1996 Telecommunications Act to examine specifically the role of the competitive mechanism in how deregulation and technological changes translate into merger activity; how merger activity in the telecom industry fits within the framework of economic shocks (Harford, 2005) in contrast to misvaluation (Rhodes-Kropf et al., 2005). Merger activity in the telecom industry fits the Harford (2005) story because it is one where both deregulation and technological changes have been linked to increases in merger activity (see Weston et al., 2004). The passage of the 1996 Act facilitated entry and the expansion of new communication technologies, including fiber optic, cellular, cable and internet. The data indicates that the increase in merger activity, following the 1996 deregulation, was an efficiency-driven restructuring response to increased competition and not increased misvaluation.

The 1996 Telecommunications Act opened both markets for local and long distance phone services to entry and more competition from new communication technologies, removing previous product and geographical boundaries set by law. Deregulation increased entry via initial public offerings (IPO), decreasing the concentration of publicly traded telecom firms. The increase in entry led to a decrease in the correlations between firms' cash flows, increasing cash flow volatility and the probability of exit. The increase in entry also facilitated the expansion of new technologies, increasing inter-firm dispersion in the quality of production technology. These changes are associated with the increase in merger activity following the 1996 deregulation, consistent with the economic shocks theory. I find that the level of potential misvaluation, measured using the Rhodes-Kropf et al. (2005) proxy for misvaluation, moved in the opposite direction of the increase in merger activity following the 1996 deregulation, inconsistent with the misvaluation theory.

I begin by analyzing the patterns of entry and exit activity for a sample of publicly traded U.S. telecoms extracted from the Center for Research in Security Prices (CRSP) database for the period from 1979 to 2009. The sample of 304 firms belong to the 4-digit Standard Industry Classification (SIC) codes 4810 to 4813, which pertain to the telephone communications sector of the broader communications industry. The increase in entry via IPO, following the 1996 deregulation, facilitated the expansion of fiber optic, cellular, cable and internet technologies in local phone markets and increased competition to the incumbent local exchange carriers (ILECs) or regional bell operating companies (RBOCs). Acquisitions of competitive local exchange carriers

(CLECs) with cellular and fiber optic platforms provided a means for long-distance carriers such as AT&T Corp and WorldCom Inc. to strengthen their entry into the local phone markets.

The response of the RBOCs to increased competition from new entrants and incumbent long-distance carriers was consolidation via merger and entry in the long-distance and cellular markets. Along with higher levels of entry and exit activity, the market values of the average IPO entry and the average merger exit are larger in the post-deregulation period than in the prederegulation period. I also find that the survival rate of entries is lower in the post-deregulation period than in the pre-deregulation period.

I examine the fate of incumbent firms following the passage of the 1996 Act and find that ex ante size and profitability or operating efficiency characteristics are important determinants of who survives versus who exits via bankruptcy. In the more competitive post-deregulation environment, smaller and less efficient incumbents are not targeted for acquisitions but instead left to face exit via bankruptcy or delisting. I also find that size and operating efficiency characteristics, as well as leverage, are important determinants of which firms become the acquirers and which firms become the targets in mergers involving incumbents; acquirers are relatively larger, more efficient and less leveraged than incumbent counterparts who become their targets.

The importance of size as a determinant of incumbent survival in the post-deregulation period is consistent with the view expressed in Maloney and McCormick (1995) that the impact of technological changes, competition and consumers demand for vertically integrated product packages (developments underway well before the draft of the 1996 Act) "means that companies that offer the bundled tour down the information interstate are most likely to survive." Overall, the evidence presented in this paper shows that the competitive mechanism played an important role in how managers in the telecommunications industry reallocated resources via mergers in response to deregulation and technological changes.

The rest of this paper proceeds as follows. Section 3.2 discusses relevant literature and lays out the testable hypotheses. Section 3.3 describes the data and sampling procedure. Section 3.4 analyzes the patterns of entry and exit activity. Sections 3.5 and 3.6 present the empirical results of the tests of the merger hypotheses. Section 3.7 concludes the paper.

3.2 Literature Review and Testable Hypotheses

First, I discuss relevant literature on the drivers of merger activity and layout my hypotheses on the role of the competitive mechanism in how economic shocks from deregulation and technological changes drive merger activity. I then discuss prior evidence from a number of empirical studies linking deregulation to increased competition. I end this section with a summary discussion of my general approach to the study.

This study focuses on the drivers of merger activity and seeks to better understand the role that efficiency plays in the industry-level clustering of merger activity. There are many alternative theories on the drivers of merger activity. Some are clearly linked to efficiency and others are not. For example, the economic shocks theory considers merger activity to be an efficiency-improving response to changes to industry structure. In constrast, the misvaluation theory considers the primary driver of mergers to be stock market misvaluations, although it is plausible that a merger driven by misvaluation may also end up providing some efficiency benefits. The same could be said of the hubris and collusion theories, where the primary drivers are overconfidence and achieving higher product prices, respectively.

Researchers have studied extensively the merger activity of the 1980s and 1990s and present evidence linking the observed industry-level clustering of merger activity during these decades to economic shocks such as deregulation (Mitchell and Mulherin, 1996; Mulherin and Boone, 2000; Andrade et al., 2001). Researchers also present evidence linking the merger activity patterns to stock market valuation (Andrade et al., 2001; Shleifer and Vishny, 2003). According to the economic shocks theory, deregulation and technological changes alter industry structure, and mergers are an efficiency-improving response by managers (Mitchell and Mulherin, 1996; Jovanovich and Rousseau, 2001, 2002). Alternatively, an inefficient stock market or asymmetric information between mangers and investors causes discrepancies in valuations, and mergers are a response by managers to stock market misvaluations (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004).

Prior tests of these alternative theories arrive at different conclusions. First, evidence shows economic shocks from deregulation, technological changes etc. drive merger activity (Harford, 2005). On the other hand, evidence shows misvaluation drives merger activity (Rhodes-Kropf et al., 2005). A challenge to reconciling these findings results from the fact that evidence based on relative valuation measures such as market-to-book (M/B) – a proxy for Tobin's Q – is ambiguous, given the potential for alternative interpretations. For instance, the stylized fact that high M/B firms buy lower M/B firms is consistent with both the economic shocks and misvaluation theories.

It is also the case that imperfect proxy variables in multi-industry studies make tests of these alternative hypotheses challenging, given that a number of plausible underlying forces could be at work in different industries at any period of time. It is plausible that apparent associations between merger activity and stock valuations mask underlying changes to industry structure brought about by economic shocks. Deregulation, as a relatively well specified economic shock, provides a unique setting or "natural experiment" for examining how economic shocks impact industry structure versus valuations, and then translate into increased merger activity. The fact that the passage of the 1996 Telecommunications Act facilitated the expansion of new communication technologies also provides an opportunity to incorporate the effects of the shocks from technological changes. Deregulation and technological changes drive industry merger activity through three channels: by increasing entry, by increasing cash flow volatility and by increasing inter-firm dispersion in the quality of production technology (Okoeguale, 2011). The increase in entry results in an increase in industry competition. The increase in cash flow volatility, which increases the probability of exit via bankruptcy, results from a decrease in the correlations between firms' cash flows as competition increases with the entry of new firms. The increase in inter-firm dispersion in the quality of production technology results from the expansion of new technologies because firms adapt to new technologies at different rates.

A first-order effect of deregulation is that an increase in entry increases industry competition and increases the number of potential merger targets. Second, the increase in competition makes mergers a valuable alternative to exit via bankruptcy or liquidation as cash flow volatility and the probability of exit increase. Third, an increase in inter-firm dispersion in the quality of production technology increases potential efficiency gains from reallocating assets via mergers. I hypothesize that the increase in merger activity after the 1996 deregulation should be associated with increases in industry competition, cash flow volatility and inter-firm dispersion in the quality of production technology. These testable hypotheses associated with the economic shocks theory are as follows.

H1: The increase in merger activity following the 1996 Telecommunications deregulation should be associated with an increase in industry competition.

H2: The increase in merger activity following the 1996 Telecommunications deregulation should be associated with an increase in cash flow volatility.

H3: The increase in merger activity following the 1996 Telecommunications deregulation should be associated with an increase in inter-firm dispersion in the quality of production technology.

The basic intuition underlying the hypotheses is that managers behave competitively to maximize the market value of their firms; increased competition, from deregulation and technological changes, forces managers to operate more efficiently by reallocating resources to better uses. Most economic theories are either implicitly or explicitly based on the argument that competition and exit assure that only the most efficient firms survive (Zingales, 1998). This study shares some common themes with the Zingales (1998) study of the impact of deregulation, which increased competition in the trucking industry, on survival. I posit that the competitive mechanism played an important role in how managers reallocated resources via mergers following the 1996 Telecommunications deregulation.

Table 3.2 shows the proxy variables employed in the tests of the two theories. Panel A shows the proxy variables associated with the economic shocks theory. The economic shock index (Harford, 2005) is a composite of the median absolute changes in seven performance variables. The level of entry is the annual number of new firms listed on CRSP each year. The Herfindahl-Hirschman index of concentration is a function of the number of firms in the industry each year and their relative market shares (dispersion among the firms' shares). It is the measure of concentration that the Department of Justice (DOJ) and the Federal Trade Commission's (FCC) Horizontal Merger Guidelines use. The level of entry and the Herfindahl-Hirschman index, however, do not completely capture every dimension of industry competition. The measures of performance dispersion – inter-firm dispersion in cash flow shocks and inter-firm dispersion in return on sales – provide potential incremental information on the impact of deregulation and technological changes on industry competition.

Panel B shows the proxy variables associated with the misvaluation theory, including the industry valuation error variable from Rhodes-Kropf et al. (2005). The market-to-book ratio, as stated earlier, is ambiguous because an association between industry merger activity and market-to-

book is subject to alternative interpretations; for example, it could be interpreted as reflecting the effect of stock market misvaluation or changes to growth opportunities (Rhodes-kropf et al., 2005). The industry valuation error variable, as a proxy for misvaluation, is based on the Rhodes-Kropf et al. decomposition of market-to-book. The testable hypothesis associated with the misvaluation theory is as follows.

H4: The increase in merger activity following the 1996 Telecommunications deregulation should be associated with an increase in industry misvaluation.

3.2.1 Prior Evidence on Deregulation and Competition

Federal regulatory agencies and the U.S. Congress began liberalizing pricing, entry, and exit in the transportation, financial, energy, and communications industries in the mid-1970s. These regulatory reforms spurred more competition, restructuring, market opportunities, innovative technologies and cost reductions in these industries. Deregulation forced firms to eliminate production inefficiencies that existed under previous regulatory structures (Winston, 1998). For example, entry barriers prevented airlines and motor carriers from developing their networks optimally, exit barriers prevented railroads from shedding excess capacity, and price regulations prevented natural gas pipelines from efficiently marketing their capacity during peak and off peak periods. The removal of entry and exit barriers decreased market power and provided firms with greater incentives to seek out efficiencies.

Substantial efficiency improvements and merger activity have generally occurred following an industry's deregulation due to increased competition (Winston, 1998). In the trucking and banking industries for instance, many weaker firms that were unable to compete effectively and efficiently in a deregulated environment sought a merger partner. Incumbent firms in the airline, banking and railroad industries used mergers to enter new markets after deregulation. Winston asserts that following deregulation, the net result of entry, exit, and mergers has generally been that competition in actual markets become more intense.

Single-industry studies reaffirm the link between deregulation and increased competition and exit. The passage of the Motor Carrier Act of 1980 increased entry and price competition in the trucking industry, resulting in the survival of the more efficient and less leveraged firms (Zingales, 1998). As a result of the intense price competition, a total of 4,589 trucking companies shut down between 1980 and 1985. In the banking industry, the passage of the Garn-St Germain Act of 1982 created a more competitive banking environment by allowing banks to enter new markets and threaten incumbents (Stiroh and Strahan, 2003). This resulted in substantial reallocation of assets to better performing banks and expansion into new markets through acquisition. Banks exit rates increased significantly, consistent with the disciplinary role of increased competition.

3.2.2 The 1996 Telecommunications Act

The Telecommunications Act of 1996, approved by congress on January 3, 1996 and signed into law on February 8, 1996 by President Bill Clinton, overhauled the Communications Act of 1934. The goal of the new law is to let anyone enter into any communications business – to let any communications business compete in any market against each other². The 1996 Act was also a response by the U.S. Congress to calls to undo the regional bell operating companies' (RBOCs) monopoly over local telephone service in the midst of new technologies including cable television, cellular (or wireless) service, the internet etc. that offered alternatives to the services provided by local telephone companies. The 1996 Act also created a process by which the RBOCs would be free

² Retrieved from fcc.gov

to offer long distance service once they made a showing that their local markets had been opened up to competition³.

The telecommunications industry is a new industry post-deregulation to the extent that it takes on a completely different competitive structure. Deregulation not only affected the level of entry or competition in the telecommunications industry but also the nature of competition – who and where the competition is. In the post-deregulation era the competition becomes less defined along product and geographical boundaries but more in global terms as companies moved towards a vertically integrated model, in line with technological developments. The 1996 Act brought an end to previous boundaries set by federal and state regulators. Shortly after the passage of the Act the Chairman and CEO of SBC Communications Inc. commented that "all of us at SBC and Southwestern Bell welcome the opportunity to focus completely on our customers and what they want and need, and not just what products we are allowed to sell by law."

Prior studies suggest that deregulation in the telecommunications industry increased competition as the markets for local and long distance phone services were opened up to new competition, facilitating the expansion of new technologies. There is little question that the 1996 Act changed the competitive environment of the telecommunications industry (see Becker, 2001; Hazlett, 1999; Economides, 1998). The 1996 Act provides a unique setting for examining the role of the competitive mechanism in how the shocks from the 1996 deregulation and the changes in technology translated into increased merger activity.

Although the 1996 Act impacted the broader communications industry, I restrict the study to the telephone communication sector of the industry for a focused examination of how the 1996 deregulation impacted competition and merger activity in a previously fragmented local and long-

³ U.S.C. section 271

distance phone market. I focus on publicly traded firms due to data availability and because it enables a contrast between the effects of competition from the economic shocks versus misvaluations on merger activity in the telecommunications industry.

3.2.3 Study Approach

In order to better understand how deregulation ties into merger activity at the industry-level, the first question I address here is whether the increase in merger activity following deregulation in the telecommunications industry is indeed associated with an increase in competition. I begin by documenting the patterns of entry and exit activity in the telecom industry before and after the passage of the 1996 Telecommunications Act. I examine whether the increase in merger activity after the 1996 deregulation was part of a broader industry restructuring response comprising increases in entry activity via IPOs and spin-offs, and exit activity via bankruptcies etc.

I then proceed to measure the impact of entry and exit activity on industry turnover and market power (industry concentration and return on assets) to further assess how the 1996 deregulation maps into increased competition. I examine whether deregulation and competition spurred measurable changes to industry cash flow volatility and inter-firm dispersion in the quality of production technology. An increase in the level of entry, by increasing industry competition, is also expected to alter firms' performance. I test the association between the changes brought about by increased competition and the changes in merger activity.

It is also plausible that the changes to merger activity following the 1996 deregulation were driven by the higher market valuations that generally accompanied the economic expansion of the late 1990s or by misvaluations on the part investors. To test the potential association between merger activity and misvaluation, I report the before and after deregulation statistics on average market-to-book ratio (M/B) for the industry, as well as variables based on the Rhodes-Kropf et al. (2005) M/B decomposition. I also report the results of multivariate tests.

I then examine the fate of the incumbent telecom firms after the 1996 deregulation to further assess whether the restructuring response of managers is consistent with the impact of deregulation on competition and incentives to seek out efficiencies. I report the financial and operating characteristics of survivors and exits after deregulation. I determine whether there are systematic differences between the firms that exit via merger and the firms that exit via bankruptcy, as well as between survivors and merger exits and between survivors and bankruptcy exits, using ex ante financial and operating data. I then conclude the study with an examination of who the acquirers and targets are in mergers involving incumbents from the pre-deregulation era.

3.3 Data Sample

To construct the data sample, I begin with the universe of firms listed on the CRSP monthly stock file, which consists of publicly traded firms on the NYSE, AMEX and Nasdaq stock exchanges. The sample period is from 1979 to 2009, which spans the 1984 and 1996 deregulation events. I restrict the sample to firms belonging to the Standard Industry Classification (SIC) codes 4810 to 4813, which pertain to the telephone communications (telecom) sector of the broader communication industry. I identify firms with CRSP Share Code 10 and 11, and thus exclude foreign firms (incorporated outside the U.S. and ADRs). This leaves us with a sample consisting only of domestic public U.S. telecom firms. I track every firm using its unique CRSP identifier, PERMNO, each year over the sample period from the time it enters the sample to the time it exits. See Table 3.3 for summary of sampling procedure.

Table 3.4 presents the time-series distribution of entry and exit activity for the sample period and Figure 1 presents the annual time series plot of the net-change, entries minus exits. There are 26
U.S. telecom firms listed on CRSP as at the beginning of 1979 and a total of 278 new firms attain CRSP listing status over the 1979 to 2009 sample period. These combine for a total of 2,186 firm-year observations based on the number of firms listed at the end of each year of the sample period, implying an average of about 70 firms per year. The number of public U.S. telecom firms increases from 26, at the beginning of 1979, to 52 at the end of 1984, after the break-up of AT&T. It then rises to 90 at the end of 1995, prior to the January 3, 1996 passage by Congress of the Telecommunications Act. After deregulation it reaches a high of 122 firms at the end of 2000, and then rapidly declines to 76 at the end of 2002, following the 2001 recession. It declines further to 45 publicly traded firms at the end of 2009.

3.4 Entry and Exit Activity

In order to gain a deeper understanding of the impact of deregulation on the structure of the telecom industry, I perform a comprehensive analysis of the patterns of entry and exit activity. Table 3.5 summarizes all entry and exit activity by category. I determine that, over the 1979 to 1980 sample period, 170 entries were via initial public offerings (IPOs) based on data from Thompson Financial's Securities Data Company (SDC) IPO database and information from news wires on LexisNexis. The information from Lexis Nexis aided in determining 42 of the IPOs. I also used information from news wires on Lexis Nexis to determine that 22 entries were the result of spin-offs of subsidiaries from public parents, and to determine the path through which the other entries attained listing status on one of the exchanges (NYSE, AMEX and Nasdaq) without an IPO.

The other entries totaling 86 firms include 6 reverse mergers, 10 bankruptcy reorganizations, and 70 other non-IPO listings. A reverse merger occurs when a private firm acquires a public firm. It is one path to attaining public listing without an IPO. The bankruptcy reorganizations involve firms that were once listed, then delisted due to Chapter 11 bankruptcy filing, and later re-attain

listing status after emerging from reorganization. The 70 other non-IPO listings mostly comprise firms previously listed on the over-the-counter bulletin board (OTC BB). The common reasons given by these firms for pursing public listing are to increase visibility, coverage, liquidity, exposure to institutional investors, and access to capital markets.

A total of 256 telecom firms exit the public markets over the 1979 to 2009 sample period and this matches up with data from the CRSP delist file, which provides descriptive delist information. I determine that 139 exits were via mergers based on data from SDC's mergers and acquisitions (M&A) database and information from news wires on LexisNexis, which aided in determining 44 of the merger exits. For the mergers, I substitute the merger announcement date for the CRSP delist date. Using CRSP delist data and news wires from LexisNexis I also determine that the exits include 48 Chapter 11 bankruptcy filings, 61 non-voluntary delists for non-compliance with listing requirements, and 8 company requested or voluntary delists. Using the news wires from LexisNexis, I find that 28 of the 88 telecom firms described on the CRSP delist file as delisted for non-compliance with listing requirements actually filed for Chapter 11 bankruptcy within a few months of the delisting event. I include these exits in the list of 48 bankruptcies.

The common reasons given for non-voluntary delists are non-compliance with minimum bid price, net tangible assets, capital and surplus requirements. These non-voluntary delists are frequently described in news wires, as at the time of delisting, as experiencing deteriorating and weak financial performance or approaching insolvency. On the other hand, the common reason given for company requested or voluntary delists is the reduction of the cost and complexity associated with complying with regulatory requirements. This is consistent with the observation that practically all the voluntary delists occurred between 2002 and 2009, following the enactment of the Sarbanes-Oxley Act of 2002. Table 3.6 shows that IPOs and spin-offs account for the majority of the total value of entry activity over the sample period. On the other hand, mergers account for the majority of the total value of exit activity. The relatively lower average market equity value of the firms that exit via bankruptcy reflects the distressed values of these firms just prior to delisting from CRSP.

Table 3.7a and Table 3.7b provide annual time-series data on entry activity (via IPO and spin-off) and exit activity (via merger and bankruptcy). Figure 3.2a and Figure 3.2b plot the annual time-series of entry activity (IPO and spin-off) and exit activity (merger and bankruptcy) by count and highlights some important transaction-related events that occurred during the sample period. Figure 3.3a and 3.3b plot the annual time-series of IPO activity (by firm market equity value) and merger activity (by target market equity value). The 1984 break-up of AT&T accounts for the first major entry event of the sample period – the spin-off of seven regional bell operating companies (RBOCs) as independent firms, giving them monopoly control over their regional local phone markets.

The deregulatory events leading up to the 1984 break-up of AT&T evolved contemporaneously with the development of microwave and fiber optic technology by firms such as MCI and Sprint, making these firms viable competitors to AT&T's wire-line long distance network (Weston et al., 2004). The next major spin-off events occur after the 1996 Act, and include the 1998 spin-offs of Level 3 Communications (a fiber-based communications services provider) and the 1999 spin-off of Voicestream Wireless Corp.

IPO activity is high in 1993 and includes the IPO carve out by Pacific Telesis Group of Pactel Cellular (which had a total market capitalization of about \$12 billion and its name changed to Airtouch Communications in 1994), and the IPO of Metropolitan Fiber Systems (MFS) Communications Inc. (which had a total market capitalization of about \$1.5 billion). Both IPOs are indicative of earlier expansions of cellular and fiber optic technologies before the passage of the 1996 Act. From 1992 to 1993 the Federal Communications Commission (FCC) made several regulatory decisions that facilitated 1) the entry of competitive local exchange carriers (CLECs) such as MFS Communications, and 2) the expansion of new technologies, fiber optic and wireless services, in the local phone markets. Teleport Communications Group (TCG), a CLEC that also deployed fiber optic systems, had its IPO in 1996. The substantial cluster of IPO activity between 1995 and 2000 reflects the notable boom in IPO activity that accompanied the late 1990s economic expansion and ended with the 2001 recession.

The fact that the rise in IPO activity began before 1996 indicates that the 1996 deregulation was not an exogenous event. Long before the Telecommunications Act was drafted, the impact of technological changes on entry and competition via cellular (e.g., McCaw Cellular had its IPO in 1987) and fiber-optic (e.g., emergence of CLECs such as MFS) was underway. Technological changes provided impetus for the regulatory decisions of the FCC form 1992 to 1993, spurred drastic changes in the market for communications services (a market dictating that companies offer a completely vertically integrated package of a growing scope and quality of products and services) and ultimately lead up to the 1996 deregulation. A February 2, 1996 statement by MTA-EMCI (a strategic and economic consulting firm focusing on telecommunications and cable television markets worldwide) describes the impact of technological changes on competition prior to the passage of the Telecommunications Act.

"Competition in communications services was underway long before the Telecommunications Act was drafted. In the market for long distance service, competition has already lowered prices and shifted market share away from AT&T to their competitors. For the last six years business customers in most major metropolitan areas have had an alternative to the local phone company. These new local phone providers offering high speed fiber optic lines at prices below the local phone company have experienced tremendous growth since their inception. Cable companies have also been subject to competition from satellite providers who now serve about 4 million U.S. subscribers. The development of wireless phone networks has enlarged the communications pie and provided consumers with an alternative means of communications. Over the past few years the industry has taken on numerous joint ventures and technical trials aimed at providing consumers with integrated communication solutions. The passage of the Telecommunications Act will further facilitate these industry developments."

Fast forward four years later to the peak of the late 1990s boom in IPO activity, and you find similar sentiments regarding the impact of technological changes being echoed. An On Wall Street article dated March 01, 2000 and titled '*The IPO Juggernaut: What's causing the boom? The exuberance surrounding the IPO market may not be as irrational as you might think*' describes the role of communications technology in the surge of IPO first-day gains. The article notes the following.

"Most pundits have correctly observed the narrowness of the hottest first-day gains. Not all industry sectors receive these white-hot gains. In fact, they are isolated into only a very few industry sectors. However, while dutifully describing the situation they have missed the root causes. In short, 'It's the industry, stupid!' IPOs in the internet infrastructure, communications networking, fiberoptic and internet productivity sectors are among the largest first-day gainers. They reflect an emerging capacity crisis in the overall communications industry."

Merger activity increased and clustered between 1996 and 2000, following the passage of the 1996 Act. In 1996 WorldCom Inc. acquired MFS Communications Inc., whose market capitalization had risen to about \$12 billion, to enable its entry into the fiber optics local loop. TCG was acquired by AT&T in 1998. AT&T began its re-entry into the local phone market with the acquisition of McCaw Cellular Communications Inc. in 1993. Consolidation in the cellular market was spurred faster by the 1996 Act. Airtouch Communications, formerly Pactel Cellular (which had its IPO in 1993) was acquired by the U.K. based Vodafone Group PLC in 1999.

Notable mergers involving the RBOCs and occurring between 1996 and 2000 include the acquisitions of two RBOCs, Pacific Telesis Group in 1996 and Ameritech in 1998, by SBC Communications Inc. – another RBOC. Similarly, Nynex was acquired in 1996 by Bell Atlantic Corp, which changed its name to Verizon in 2000 after acquiring GTE Corp in 1998; US West was acquired in 1999 by Qwest, which had its IPO in 1997. The appeal of the Chairman and CEO of Pacific Telesis to California regulators to give the green light to its merger with SBC in 1996 reflects the view that these consolidations involving the RBOCs were competitive imperatives. He noted that "those suggesting that Pacific Bell can continue to be a major player in today's global markets are in a sever state of denial." Adding that "if Pacific Bell is going to be successful in the future, it must have the resources to stand up to the major competitors (e.g., AT&T and MCI) it will face." MCI Communications Corp merged with WorldCom in 1998.

I have record of 1 exit via bankruptcy from 1979 to 1995, 10 bankruptcies from 1996 to 2000, and 32 bankruptcies from 2001 to 2002, including the bankruptcy of WorldCom Inc. in 2002. The 2001 to 2002 bankruptcies reflect the impact of the 2001 recession on the telecom industry. The data discussed so far shows that the 1996 Act was followed by increases in entry activity, via IPOs, and exit activity via mergers and bankruptcies.

I then examine whether significant differences exist between the firms that enter and exit during the pre-deregulation period (a 17-year period from 1979 to 1995) and those that enter and exit during the post-deregulation period (a 14-year period from 1996 to 2009). Table 3.8 shows that the total market equity values (in 2010 dollars) of IPO and spin-off entry activity are larger during the post-1996 period compared to the pre-1996 period. The same also goes for merger and bankruptcy exit activity. The *t*-statistics indicate that the average size of an IPO entry in a particular year is significantly larger during the post-deregulation period than the average size during the pre-

deregulation period. Similarly, the average size of a merger target in a particular year is significantly larger during the post-deregulation period.

Table 3.9 presents summary data on the financial and operating characteristics of the entries and exits during the pre-deregulation and the post-deregulation periods. The size measures are in means while the performance and leverage ratios are in medians. The size measures indicate that the pre-deregulation entries and exits, as well as the post-deregulation entries and exits, are smaller compared to the average telecom firm in the respective sample periods. This suggests that incumbent survivors are typically larger than entries and exits. I conduct more detailed analysis and tests of statistical significance in the next section of the paper. The incumbent survivors also seem to posses higher profit ratios (based on the median income/sales, income/assets, cash flow/sales and cash flow/assets ratios) than the entries or exits. However, the median market-to-book (M/B) ratio of the entries is larger than the median M/B of the exits, as well as the median M/B of all telecom firms, in both sample periods. The entries have lower median leverage ratios in both periods.

Consistent with the evidence in Table 3.8 that the average IPO entry and merger exit is larger (by market equity) in the post-deregulation period, Table 3.9 shows that the post-deregulation entries and exits are on average larger than their pre-deregulation counterparts, across most of the size measures. Additional analysis of the data reveals that there are 99 entries from 1985 (after the break-up of AT&T) to 1995, and 58 survive through 1995 - a 59% survival rate. In contrast, of the 143 entries from 1996 to 2006, 47 survive through 2006 - a 33% survival rate. This indicates that the survival rate of entries post-deregulation is lower than the survival rate pre-deregulation.

Focusing on just the IPOs, I find 64 IPO entries from 1985 to 1995, and 39 of these survive through 1995, a 61% survival rate. In contrast, of the 93 IPO entries from 1996 to 2006, 27 survive through 2006, a 29% survival rate. This indicates that the survival rate of IPO entries post-

deregulation is lower than the survival rate pre-deregulation. Of the 11 spin-offs from 1979 to 1995, all survive through 1995, which is a 100% survival rate. But of the 11 spin-offs from 1996 to 2006, 4 survive through 2006, a much lower 36% survival rate; 9 of the 11 pre-deregulation spin-offs (7 of which resulted from the AT&T break-up) were acquired between 1997 and 2006 and 10 of the 11 post-deregulation spin-offs occurred between 1997 and 2001.

In summary, the patterns and characteristics of entries and exits documented here are consistent with an industry environment that becomes more competitive, with higher levels of IPO, merger and bankruptcy activity, after the 1996 deregulation. In the next section I focus my analysis on the association between the 1996 deregulation and the increase in competition, and how it possibly ties into the increase in merger activity.

3.5 Empirical Tests of Telecom Merger Hypotheses

3.5.1 Impact of Deregulation on Competition in the Telecom Industry

The first of the tasks of this section is to establish evidence associating the 1996 deregulation to the increase in competition. In order to do this, I focus my analysis on two event windows centered on the 1996 deregulation: a shorter window starting from 5 years before to 5 years after deregulation, and a longer window from 10 years before to 10 years after deregulation. Winston (1998) finds that substantial merger activity has generally occurred within a decade of an industry deregulation. In most of the discussions that follow, in this section, I will place greater emphasis on the results from the shorter 5 years before to 5 years after deregulation window because it would be less influenced by confounding factors. For instance, the 2001 recession would be expected to influence the results from the longer 10 years before to 10 years after deregulation window. I compute 5-year and 10-year averages of a number of annual measures, before and after deregulation, to assess the impact of the 1996 deregulation on competition in the telecom industry.

Table 3.10a, Panel A, presents the 5-year averages of measures of entry, exit, industry turnover, industry concentration and return on assets (ROA), before and after deregulation, and the test of statistical significance of the differences in means. The average level of entry activity (by count) increased 96% after deregulation and it is statistically significant. Similarly, the average level of exit activity after deregulation increased 144% from the pre-deregulation level, and it is also statistically significant. The levels of IPO, merger and bankruptcy activity increased significantly after deregulation. This shows that the increase in merger activity is indeed part of a broader industry restructuring response to deregulation. What is a plausible explanation for the increase in IPO activity? Lowry (2003) proposes two general hypotheses: changes in firms' demands for capital or changes in the level of investor optimism. Both hypotheses are supported here by the fact that the 1996 deregulation of entry facilitated the expansion of new communication technologies.

The increases in entry activity via IPO and exit activity via merger and bankruptcy are consistent with other empirical regularities from prior studies, which suggest that turnover rates of firms and merger activity are codetermined. For example, Rau and Stouraitis (2011) document a distinct pattern in corporate event waves. They find that new issue waves, with seasoned equity offerings (SEOs) preceding IPOs, are followed by stock-finance merger waves. In this study, I find that the increases in entry and exit activity, after the 1996 deregulation, translated into significant increases in average industry turnover rates of 57% and 400%, by count and value, respectively. In this case the increases in the levels of entry and exit activity can be said to have been codetermined by telecommunications deregulation.

I measure the effect of entry on market power using the Herfindahl-Hirschman index of industry concentration and the average return on assets (ROA). I compare the 5-year averages of these measures before and after deregulation and find that the average Herfindahl-Hirschman index decreased by 21% and average ROA decreased by 45%, and both changes are statistically significant.

The increase in entry activity results in decreases in industry concentration and return on assets, evidence of an increase in industry competition. This result is also evident in the changes computed from the 10-year averages of the measures (Table 10b, Panel A). Not surprisingly, the level of entry activity via IPO loses its significance over this longer window, and this can be attributed to the adverse effect that the 2001 recession had on telecommunications capacity and investments. The change in the 10-year average measure of merger activity remains significant.

Did the change in industry competition after 1996 revert to the orginal pre-1996 level say after 2000, following the impact of the 2001 recession on telecommunications capacity and demand? Table 3.10c shows the changes to the competition measures from the first 5-year period after deregulation to the second 5-year period (2001 to 2005) after deregulation. Not surprisingly, entry activity (via IPOs) drops drastically to a level even lower than the pre-deregulation level. Merger activity reverts to the pre-deregulation level. In contrast, bankcruptcy activity does not decrease, but shows an insignificant increase as most of the activity is confined to 2001 and 2002. Industry turnover shows an insignificant decrease, not reverting to the pre-deregulation level given the rise in bankruptcies.

The Herfindahl-Hirschman index, however, increases significantly. This suggests that industry competition, in terms of the concentration of firms and market shares, reverts to the prederegulation level after the increase of the first 5 years of the post deregulation period. But the decline in the level of return on assets (ROA) during the first 5 years of the post-deregulation era remains evident in the next 5 years, indicating that this measure of industy market power or competitiveness does not revert to the pre-deregulation level. Similarly, the economic shock index and the dispersion in cash flow shocks both show insignificant declines; they do not revert to their pre-deregulation levels.

3.5.2 Univariate Tests of Economic Shocks versus Misvaluation Hypotheses

The increase in entry following the 1996 deregulation, the evidence shows, resulted in both an increase in industry competition and an increase in merger activity. The question then is how did the increase in competition translate into increases in merger activity? One hypothesis is that the increase in merger activity after the 1996 deregulation is the result of the increase in competition and the impact of competition on firms' performance dispersion. The predicted first-order effect of the increase in industry competition, resulting from the increase in entry, is that the number of potential targets and the feasible set of merger possibilities increase. A second-order effect of the increase in competition is that cash flow volatility increases as the correlations between firms' cash flows decrease. The expansion of new technologies that accompanied the increase in entry is expected to increase inter-firm dispersion in the quality of production technology because firms adapt to new technologies at different rates.

An alternative hypothesis is that the increase in merger activity is the result of an increase in stock market misvaluations after the 1996 deregulation. The late 1990s was a period of relatively high market valuations that coincided with the dot.com era. The tech-heavy NASDAQ stock market had a dramatic run-up in the late 1990s and reached an all-time high in 2000, just before its dramatic collapse. So it is plausible that misvaluations played an important role in driving mergers in the telecommunications industry. I test these alternative hypotheses using data pertaining to all the firms belonging to the communications industry (SIC codes 4810 - 4899), given that the broad intent of the Telecommunications Act of 1996 is to allow every communication business to compete with any other in any market using any communication technology infrastructure.

I first examine the significance of the impact of deregulation and competition on the firms' performance using Harford's (2005) "economic shock index" – a composite (the first principal

component) of the median absolute changes in seven performance variables. The variables are: return on sales (ROS), return on assets (ROA), asset turnover, research and development scaled by assets, capital expenditures scaled by assets, employee growth and sales growth. These variables are computed using annual data from the CRSP/Compustat Merged Fundamentals Annual file for the firms belonging to the telecommunications industry. Table 3.10a, Panel B, reports the 5-year average values of the economic shock index before and after deregulation, and the t-statistics of the difference in means indicates that the 1996 deregulation resulted in significant changes to the firms' performance. But the economic shock index, being an aggregate of seven variables, does not help to describe or delineate the nature of the changes to the firms' performance, and how the changes relate to competition.

I measure the impact of the increase in competition on cash flow volatility using the crosssectional standard deviation of the shocks to firms' quarterly cash flows. The quarterly cash flow data is from the CRSP/Compustat Merged Fundamentals Quarterly file. The firms' quarterly cash flows are scaled by the number of common shares outstanding and then winsorized at the 1st and 99th percentiles. The quarterly cash flow shocks are estimated from pooled cross-sectional and timeseries industry-level regressions (see Irvine and Pontiff, 2009)) that control for the seasonal variation and documented persistence in cash flow:

$$C_{ijt} - C_{ijt-4} = \varphi_1 + \beta_1 (C_{ijt-1} - C_{ijt-5}) + \beta_2 (C_{ijt-2} - C_{ijt-6}) + \beta_3 (C_{ijt-3} - C_{ijt-7}) + \mu_{ijt}$$
(3.1)

 C_{ijt} is the quarter *t* cash flow for firm *i* belonging to industry *j*. $C_{ijt} - C_{ijt4}$ is the difference between current quarter *t* cash flow and cash flow from four quarters ago (same quarter of the preceding year). The residuals, μ_{ijt} , from equation (1) are the quarterly cash flow shocks. The quarterly cash flow shocks are deflated by end of quarter share price. A higher inter-firm dispersion in quarterly cash flow shocks implies lower correlations between firms' cash flows. I measure the impact of technological changes on inter-firm dispersion in the quality of production technology using the cross-sectional standard deviation of return on sales (ROS) or cash flow/sales. ROS serves as a proxy for production efficiency (see Zingales, 1998). Because it captures the relationship between operating revenues and operating costs, it is a convenient measure of the efficiency or quality of a firm's production technology. I compute ROS using annual data from the CRSP/Compustat Merged Fundamentals Annual file.

Table 3.10a, Panel B, shows that the 5-year averages of inter-firm dispersion in cash flow shocks and inter-firm dispersion in ROS increased significantly after the 1996 deregulation. This empirical evidence supports the hypothesis that the increase in competition, following the 1996 deregulation, increased merger activity by increasing cash flow volatility (H2) and inter-firm dispersion in the quality of production technology (H3). The increase in dispersion in cash flow shocks results as the correlations between firms' cash flows decrease, and the increase in dispersion in ROS results as differences in the rate of adaptation to new technology increase.

The dispersion in return on sales (ROS) actually reverts to its pre-deregulation level. This suggests that the impact of deregulation on dispersion in the quality of production technology, given differences in the rates at which firms adapt to new technology, was temporary. This also suggests that much of the restructuring response to increased competition from deregulation and changes in technology was over by the turn of the decade and with the onset of the 2001 recession. The rise in bankruptcies in 2001 and 2002 may have contributed to an exit of less efficient firms. I examine this possibility in the next section.

Table 3.10a, Panel B, also reports market valuation measures and shows that the 5-year average market-to-book (M/B) ratio actually declines after deregulation, although the change is not significant. This insignificant change in the average M/B ratio is in spite of the fact that the overall

stock market generally attracted high valuations during the economic expansion of the late 1990s, suggesting that competition had a dampening effect on valuations.

I also introduce the valuation variables from the Rhodes-Kropf et al. (2005) M/B decomposition to examine the effect of potential stock market misvaluation on merger activity. The first variable from the decomposition is a measure of market price to fundamental value (M/V) and the second is a measure of fundamental value to book value (V/B). As in Rhodes-Kropf et al. (2005), I decompose M/B by running industry-level cross-sectional regressions of firm-level market equity on firm accounting data each year to decompose M/B. I match firms' fiscal year accounting data from Compustat with CRSP market equity at fiscal year-end and run the following regression⁴ of market equity (**m**) on book equity (**b**), net income (**NI**) and leverage (**LEV**).

$$\mathbf{m}_{it} = \alpha_{0jt} + \alpha_{1jt}\mathbf{b}_{it} + \alpha_{2jt}\ln(\mathbf{NI})^{+}_{it} + \alpha_{3jt}\mathbf{I}_{(<0)}\ln(\mathbf{NI})^{+}_{it} + \alpha_{4jt}\mathbf{LEV}_{it} + \varepsilon_{it}$$
(3.2)

I apply the industry-year multiples and their long-run industry averages from the regression to the firm-level, time-varying accounting information to compute the industry market-to-value (M/V) and long-run value-to-book (V/B) ratios. V/B measures the component of market valuation that reflects growth opportunities based on long-run industry average multiples. M/V measures the component of market valuation that reflects potential misvaluation based on the deviation of shortrun industry multiples from their long-run average values. Rhodes-Kropf et al. (2005) assert that the deviation could be interpreted as reflecting the fact that an industry may be over-heated at a point in time, given knowledge held by management that was unknown to the market at the time, and does not require that assets be mispriced in an asset-pricing sense.

⁴ Market equity (\mathbf{m}_{it}) and book value of equity (\mathbf{b}_{it}) are computed in logs (hence the lowercase) to account for the right skewness in the accounting data. **NI**⁺ stands for the absolute value of net income and $I_{(<0)}$ $\ln(\mathbf{NI})^+_{it}$ is an indicator function for negative net income observations. And **LEV**_{it} is the leverage ratio. Estimating this cross-sectional regression for each industry-year, allows the industry multiples ($\alpha_{k, k} = 0, ..., 4$) to vary both over time and across industries (see RRV (2005)).

Table 3.10a, Panel B, shows that the Rhodes-Kropf et al. (2005) proxy for misvaluation, industry valuation error, also declines after deregulation and the change is significant at the 10% level. But the direction of the change is contrary to what the misvaluation hypothesis (H4) would predict. Over the longer 10-year windows before and after deregulation (see Table 3.10b, Panel B), the decline in the M/B ratio is significant while the decline in the misvaluation variable is insignificant. The significant decline in the M/B ratio probably reflects the impact of the 2001 recession.

3.5.3 Multivariate Tests of Economic Shocks versus Misvaluation Hypotheses

To test for a direct assocation between the increase in merger activity and the increase in competition, I run regressions of merger activity on the proxy variables. Table 3.11 (Panel B) shows the correlations between the proxy variables. The economic shocks index (ECON SHOCK INDEX) is positively correlated (0.40) with the level of entry (ENTRY), positively correlated (0.45) with the dispersion in cash flow shocks (DISP CFLOW SHOCK), and positively correlated (0.69) with the dispersion in return on sales (DISP ROS). ENTRY is positively correlated (0.40) with DISP CFLOW SHOCK, positively correlated (0.68) with DISP ROS and positively correlated (0.52) with M/B. DISP ROS is positively correlated (0.51) with DISP CFLOW SHOCK, and positively correlated (0.43) with M/B. And M/B is positively correlated (0.43) with industry valuation error (IND ERROR) and positively correlated (0.60) with V/B.

Table 3.12a shows the regression results with merger activity, measured by annual count, as the dependent variable. The result from regression Model I, with ECON SHOCK INDEX and M/B as the explanatory variables, shows that the ECON SHOCK INDEX variable is positively and significantly associated with merger activity. The coefficient on M/B is positive but insignificant. In regression Model II the variables decomposed from M/B, using the Rhodes-Kropf et al. (2005) method, are substituted for M/B. The result shows that the ECON SHOCK INDEX remains positively and significantly associated with merger activity. The coefficient on the industry valuation error variable, proxy for misvaluation, is positive but insignificant. The coefficient on V/B, measuring long-run growth opportunities, is positive and significant at the 10% level.

Regression Model III substitutes ENTRY and DISP CFLOW SHOCK for the ECON SHOCK INDEX, and both variables are significantly associated with merger activity. The misvaluation variable remains insignificant and the adjusted R-square improves from 0.21 (Model II) to 0.46 (Model III). Model IV substitues the DISP ROS variable for the ECON SHOCK INDEX, and the result shows a significant and positive assocation between DISP ROS and merger activity. The variables from the M/B decomposition, including the misvaluation variable, are insignificant. Model V includes all the explanatory variables in the regression equation, and the coefficents on ENTRY and DISP CFLOW SHOCK are positive and statistically significant. With respect to economic significance, the result indicates that a one standard deviation (6.96) increase in the level of entry increases the annual count of merger activity by 2.23; a one standard deviation increase in inter-firm dispersion in cash flow shocks increases the annual count of merger activity by 1.03.

I obtain similar regression results with merger activity measure by annual market equity value of targets (see Table 3.12b). The coefficents on ENTRY and DISP CFLOW SHOCK are positive and significant. Here a one standard devation (6.96) increase in the level of entry increases annual value of merger activity by \$20.74 billion; a one standard deviation increase in inter-firm dispersion in cash flow shocks increases the annual value of merger activity by \$38.08. The regression results show a direct positive association between competition and merger activity in the telecommunications industry. In summary, the evidence presented in this section shows that the significant increase in merger activity, following the 1996 deregulation, supports the economic shocks hypotheses with the role of competition, but does not support the misvaluation hypothesis.

3.6 Impact of Deregulation on Incumbents' Survival and Merger Activity

3.6.1 Survival and Exit of 1996 Incumbents

The evidence from the previous section indicates that the increase in merger activity, after the 1996 telecom deregulation, was part of a broader industry restructuring response to increased competition. In this section, I examine additional evidence to determine whether the increase in merger activity was an efficiency-driven restructuring response by managers to increased competition by examining the fate of incumbent telecom firms following the passage of the 1996 deregulation. The approach employed here is similar to that used in Zingales (1998).

The incumbent telecom firms are the firms listed on CRSP just prior to the January 3, 1996 approval by Congress of the Telecommunications Act. I track the 90 incumbent firms from 1996 through 2001 (5 years later) and then through 2006 (10 years later), and indentify the survivors and exits over these time intervals. Table 3.13 presents financial and performance characteristics for the 1996 incumbents that survive or exit over the 1996 to 2001 and the 1996 to 2006 time intervals. Although on average the incumbent firms that survive over the 1996 to 2001 interval are larger, but not significantly (*t*-statistics not reported), across all size characteristics (based on ex ante data from 1995) than the incumbent firms that exit. I also find insignificant differences in measures of profitability (income/sales, income/assets, cash flow/sales and cash flow/assets) between the survivors and exits over the 1996 to 2001 interval.

Similarly, I do not find significant differences in size or leverage characterisitcs, based on ex ante data from 1995, between incumbent survivors over the 1996 to 2006 interval and the incumbent firms that exit over the same interval. This is also the case over the 2001 to 2006 interval. However, I do find that the 1996 incumbents that survive through 2006, compared to the exits, are the more profitable firms based on ex ante data; the differences across all four profitablity measures are statistically significant. The following *t*-statistics of the test of differences in means (in parenthesis) refers to the null hypothesis that there is no difference between the 1996 incumbents that survive through 2006 versus 1) the exits from 1996 to 2006, and 2) the exits from 2001 to 2006, respectively: income/sales (4.19; 2.18), income/assets (5.04; 1.95), cash flow/sales (3.48; 2.14), cash flow/assets (4.01; 2.55). The results indicate that an incumbent firm's ex ante profitability or production efficiency is an important determinant of its long-term survival or exit probability after the 1996 deregulation.

But it is plausible that poor profitability or operating efficiency is a more important determinant of exit via bankruptcy or non-volutary delisting than exit via merger. Table 3.14 presents the ex ante financial and performance characteristics of the 1996 incumbents that exit over the 1996 to 2001 and 2001 to 2006 intervals by exit type. The data indicates that the incumbent firms that exit via merger exhibit better ex ante profitability or production efficiency and are larger than the incumbent firms that exit via bankruptcy or non-voluntary delisting. To further investigate the ex ante characteristics of exiting incumbents after deregulation, I group the bankruptcy and non-voluntary exits into a single group that I refer to as non-merger exits and focus the subsequent analyses on the 1996 to 2001 interval, to exclude the influence of the 2001 recession on the results. I group both bankruptcy and non-voluntary exits under non-merger exits because both sets of exits comprise firms often associated with deteriorating financial conditions and insolvency.

Table 3.15a presents the ex ante financial and performance characteristics, based on ex ante data from 1995, of the 1996 incumbent survivors and non-merger exits over the 1996 to 2001 interval. The data shows that the incumbent survivors possess higher ex ante profitability or production efficiency and are larger in size than the incumbent non-merger exits. Table 3.15b presents the ex ante financial and performance characteristics of the 1996 incumbent survivors and merger exits over the 1996 to 2001 interval. In this case, I do not find significant ex ante differences

between the 1996 incumbents that survive versus those that exit via merger. The results indicate that the smaller and less efficient incumbent firms are not targeted for acquisitions but instead left to face exit from the public markets via bankruptcy or non-voluntary delisting.

The evidence shows that ex ante size and profitability or production efficiency characteristics are important determinants of who survives versus who exits via non-merger paths after the 1996 deregulation; smaller and less efficient incumbents exit via bankruptcy. This is consistent with the disciplinary or efficiency-improving role of competition. Zingales (1998) suggests that size may be a proxy for efficiency because only efficient firms become big or because larger firms have more bargaining power in a more competitive environment and/or have easier access to financing. Size may also proxy for some unobserved heterogeneity in the quality of firms' production technology such that larger firms adapt more efficiently to the impact of new technology. Larger incumbents may well have been better positioned to adapt to consumer demand for a vertically intergrated product package – an industry trend that had begun prior to the draft of the Telecommunications Act (see Maloney and McCormick, 1995).

3.6.2 Who are the Acquirers?

Two important findings emerge from the preceeding analysis: 1) the 1996 deregulation forced the smaller and less efficient firms to exit the public markets via bankruptcy and nonvoluntary delisting, 2) the 1996 incumbents that become targets in a merger are not systematically different from the incumbents that survive, based on their pre-deregulation financial and performance characteristics. Next, I examine who, from the group of incumbent survivors, become the acquirers in merger transactions where the targets are also from the group of 1996 incumbents.

Of the 34 1996 incumbent firms that exit via merger, i.e. transactions where the target is a 1996 incumbent, 18 involve an acquirer that is also a 1996 incumbent. In other words, just over half

of the incumbent telecom firms that exit via merger, within the 5-year period after deregulation, have other incumbent firms as their acquirers. This suggsts that a good number of the merger exits are acquired by recently listed public telecoms. Table 3.16 presents the financial and performance characterists of the incumbent acquirers and the incumbent targets involved in the 18 merger transactions. The data shows that the firms, from among the 1996 telecom incumbents, who become acquirers of incumbent targets are on average larger and more profitable or efficient than the targets, based on ex ante data from 1995. The acquirers are also the less leveraged incumbents.

I summarize the results of this section as follows. The 1996 deregulation, by increasing competition, resulted in acquisitions of incumbents by other larger and more efficient incumbents. Although, I do not find systematic differences in size, efficiency and leverage characteristics between the 1996 incumbents that generally survive and those that exit via merger, the data shows that size and production efficiency, as well as leverage, are imporant determinants of who becomes the acquirer and the target in a merger where both firms are incumbents from the pre-deregulation era. The role of leverage here would be consistent with Zingales' (1998) finding, which suggests that in a more competitive post-deregulation environment, lower leverage may strengthen a firm's relative competitive position and enable it successfully finance new investments including acquisitions.

3.7 Conclusion

In this study, I examine in detail how deregulation and technological changes impacted the structure of the telecom industry and test whether mergers, following deregulation, are a response by managers to increased competition from economic shocks or to misvaluations. The 1996 Telecommunications Act, which opened the markets for local and long distance phone services to competition from new communication technologies, provides a natural setting for a test of these alternative theories of merger activity.

Deregulation increased entry via initial public offerings (IPO), decreasing the concentration of publicly traded telecom firms. The increase in entry led to a decrease in the correlations between firms' cash flows, increasing cash flow volatility and the probability of exit. The increase in entry also facilitated the expansion of new technologies, increasing inter-firm dispersion in the quality of production technology. These changes are associated with the increase in merger activity following the 1996 deregulation, consistent with the economic shocks theory. I do not find an association between potential misvaluation, measured using the Rhodes-Kropf et al. (2005) proxy for misvaluation, and the increase in merger activity following the 1996 deregulation, inconsistent with the misvaluation theory.

The data indicates that the mergers, following the 1996 deregulation, were an efficiencydriven restructuring response by managers to increased competition. The evidence shows that the competitive mechanism played an important role in how managers in the telecommunications industry reallocated resources via mergers in response to deregulation and technological changes.

Table 3.1: Relevant Literature

This table provides a list of prior research papers that are relevant to our study. It also lists the time period covered in each paper, the number of industries and the main (relevant) findings.

Research Paper	Time Period	# Ind.	Main (relevant) Finding(s)
Panel A: Drivers of Merger Activity – 7	Tests of alternative T	theories	
Harford (2005)	1981 – 2000	48	Economic, deregulation and technological shocks drive industry merger waves
Rhodes-Kropf et al. (2005)	1978 - 2001	12	Misvaluation drives merger activity
Panel B: Merger Activity and Deregulat	ion		
Mitchell and Mulherin (1996)	1982 – 1989	51	Mergers cluster by industry and in time. Change forces include deregulation and oil shocks
Mulherin and Boone (2000)	1990 – 1999	59	Mergers and divestiture cluster by industry. Change forces include deregulation
Andrade et al. (2001)	1973 – 1998	varied	Industry clustering varies across merger booms. Deregulation an important force, especially in 1990s
Panel C: Deregulation and Competition			
Winston (1998)	70s to 90s	5	Deregulation increased entry and exit in airlines, trucking, railroad, banking and natural gas; real operating costs and productivity improved
Zingales (1998)	1976 – 1985	1	Deregulation increased entry and exit in trucking ('80); results in the survival of the more efficient and less leveraged firms
Stiroh and Strahan (2003)	1976 – 1994	1	Deregulation increased entry and consolidation in banking ('82); substantial reallocation of assets to better performing banks
Gaspar and Massa (2006)	1962 - 2001	varied	Market power decreased after deregulation in airlines ('78), electricity ('78), natural gas ('78) & telecom ('82): associated with increased idiosyncratic risk
Irvine and Pontiff (2009)	1962 - 2003	varied	Idiosyncratic risk increases after deregulation in banking ('94), entertainment ('84), telecom ('96), trucking ('80) & utilities ('92); coincides with an increase in turnover, decrease in ROA etc.
Panel D: Deregulation and Competition	in the Telecommuni	cations Indus	stry
Green and Lehn (1995)	1992 – 1994	1	Announcement of regulatory decisions by the FCC ('92) to facilitate competitive entry into the local phone market associated with a significant decline in the aggregate value of the RBOCs
Maloney and McCormick (1995)	1992 – 1994	1	Event study evidence indicate wealth being increased by vertical realignment of resources in the industry
Hazlett (1999)	1999	1	Event study evidence of three merger announcements supports the efficiency view of mergers and rejects the market power explanation
Weston et al. (2004)	90s and 00s	1	Deregulation ('96) increased industry risk (beta)

Table 3.2: Proxy Variables for Tests of Alternative Theories

This table presents proxy variables employed in tests of the alternative theories. Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. The level of entry is the number of new telecom firms listed on CRSP each year. Herfindahl-Hirschman Index is the sum of the squared market shares of firms in the industry each year. Inter-Firm Dispersion in Cash Flow Shocks is measured each year as the cross-sectional standard deviation of firms' quarterly cash flow shocks. Inter-Firm Dispersion in ROS is the cross-sectional standard deviation of firm's return on sales (cash flow/sales). M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) is computed using the Rhodes-Kropf et al. (2005) M/B decomposition.

Theory	Proxy Variables				
Panel A					
Economic Shocks	Economic Shock Index (Harford, 2005)				
	Level of Entry (H1)				
	Herfindahl-Hirschman Index (H1)				
	Inter-Firm Dispersion in Cash Flow Shocks (H2)				
	Inter-Firm Dispersion in Return on Sales (H3)				
Panel B					
Misvaluation	Market-to-Book ratio				
	Industry Valuation Error (Rhodes-Kropf et al., 2005)				

Table 3.3: Sampling Procedure and Data

This table sketches out the sampling procedure used in arriving at the data sample. I begin with the universe of CRSP listed firms and end up with a sample of unique U.S. public telecom firms for the sample period.

Panel A: Sampling Procedure

- a. Publicly traded firms listed on CRSP (NYSE, AMEX and Nasdaq) for the period 1979 to 2009
- b. Firms belonging to the three-digit SIC code 481 telephone communications segment of telecommunications
- c. Firms with CRSP Share Codes 10 and 11, which excludes foreign incorporated firms and ADRs etc.
- d. Every firm's unique PERMNO is tracked each year from the first to the last time it appears on CRSP
- e. Firms with dual class shares are identified using the CRSP Share Class and adjusted for
- f. Firms that enter and exit CRSP listing in the same year are excluded

Par	nel B: Sample	
a.	Initial in 1979:	26
b.	Final in 2009:	45
c.	Total unique firms:	304
d.	Firm-year observations:	2, 186
e.	Entries	278
f.	Exits	256

Table 3.4: Time-series Count of CRSP Telecom Entry and Exit Activity

This table reports the time-series distribution of a sample of U.S. public telecom firms, identified from CRSP each year of the 1979 to 2009 sample period. 304 telecom firms listed on CRSP are tracked over the sample period using their unique CRSP PERMNO. In addition to the 26 telecom firms listed on CRSP as at the beginning of 1979, 278 firms enter the public market (list on CRSP) and 256 exit the public market (delist from CRSP) over the sample period. These firms belong to the three-digit SIC code 481, which identifies firms in the telephone communications segment of the telecommunications industry. The sample comprises domestic firms, excluding foreign incorporated firms and ADRs.

Year	Beginning	Entries	Exits	Net Change	Ending
1979	26	0	1	-1	25
1980	25	5	3	2	27
1981	27	5	1	4	31
1982	32	1	0	1	33
1983	32	9	1	8	40
1984	40	14	2	12	52
1985	52	5	4	1	53
1986	53	10	4	6	59
1987	59	8	5	3	62
1988	64	11	4	7	71
1989	69	7	5	2	71
1990	72	4	7	-3	69
1991	70	11	8	3	73
1992	73	5	4	1	74
1993	72	12	4	8	80
1994	81	13	9	4	85
1995	90	12	7	5	95
1996	89	24	8	16	105
1997	108	12	15	-3	105
1998	107	16	15	1	108
1999	107	28	23	5	112
2000	116	26	17	9	125
2001	122	3	29	-26	96
2002	92	6	20	-14	78
2003	76	5	6	-1	75
2004	76	5	4	1	77
2005	76	9	12	-3	73
2006	78	5	15	-10	68
2007	63	5	9	-4	59
2008	62	1	5	-4	58
2009	56	0	9	-9	47

Figure 3.1: Annual Time-series of the Net-change, Entries minus Exits

This table presents the annual time-series plot of the number of new telecom entries, net of exits - the net-change.



Table 3.5: Entries and Exits

This table presents the breakdown of the entries and exits by type – the path taken by a firm towards achieving CRSP listing or delisting status. A firm achieves listing status either via an initial public offering (IPOs), spin-off of by a public parent, reverse merger (acquisition of a public firm by a private firm), reorganization (emergence from Chapter 11 bankruptcy) or non-IPO public listing (on successfully meeting minimum listing requirements set by the exchange). A firm achieves delisting status either via merger (takeover), bankruptcy (Chapter 11), non-voluntary delisting (for failure to meet minimum listing requirements set by the exchange) or voluntary delisting.

Туре	Number	Example
Panel A: Entries		
IPO	170	Pactel Corp (renamed AirTouch Communications in 1994) - 1993
Spin-off	22	Southwestern Bell Corp (one of the seven the Baby Bells) – 1984
Reverse Merger	6	Caprock Communications Corp – 1998 merger with IWL Com. Inc.
Reorganization	10	MCI Inc. – 2004 emergence from Chapter 11
Non-IPO Public Listing	70	Hickory Tech Corp – 1995
Panel B: Exits		
Merger	139	Bellsouth Corp – 2006 merger with AT&T Inc.
Bankruptcy	48	Worldcom Inc. – 2002 filing for Chapter 11
Non-voluntary	61	Globalnet Inc 2001 delisting for failure to meet requirements
Voluntary	8	Lynch Interactive Corp – 2005 voluntary delisting

Table 3.6: Summary of Entry and Exit Activity in nominal dollars

This table provides a summary breakdown of the total CRSP telecom entry and exit activity by market equity value (total, mean and median) in nominal dollars. The U.S. public telecom entry and exit activity is categorized based on the paths taken by the firms to listing on or delisting from CRSP. 170 entries are via initial public offering (IPO) are identified using data from SDC IPO database and news wires on Lexis Nexis. Entries via spin-off of subsidiaries by public parents, reverse merger (the acquisition of a CRSP listed firm by a private firm), bankruptcy reorganization, and non-IPO public listing are identified and confirmed using information from news wires on Lexis Nexis. 141 exits via merger are identified using data from SDC M&A database and news wires on Lexis Nexis. Exits via Chapter 11 bankruptcy, non-voluntary delist, and voluntary delist and identified from the CRSP delist file, supplemented with information from news wires on Lexis Nexis.

Panel A: Entries	Count	Equity Market Value					
		Sum (\$ mil)	% of Sum	Mean (\$ mil)	Median (\$ mil)		
IPO	170	114,534.53	36.35%	673.73	208.94		
Spin-off	22	175,349.91	55.66%	7,970.45	5,535.06		
Merger	6	7,552.98	2.40%	1,258.83	253.74		
Bankruptcy Reorganization	10	9,165.56	2.91%	916.56	412.00		
Other Non-IPO public listing	70	8,447.95	2.68%	120.69	44.52		
All Entries	278	315,050.94	100.00%	1,133.28	170.75		
Panel B: Exits	Count		Equi	ty Market Value			
		Sum (\$ mil)	% of Sum	Mean (\$ mil)	Median (\$ mil)		
M&rA	130	720 700 58	08 74%	5 250 36	440.70		

		ouni (@ ninj	70 01 0 uiii	Mean (@ min)	Meenani (@ min)
M&A	139	729,799.58	98.74%	5,250.36	440.70
Chapter 11 Bankruptcy	48	8,518.47	1.15%	177.47	19.68
Non-voluntary delists	61	642.44	0.09%	10.53	6.14
Voluntary delists	8	121.45	0.02%	15.18	10.17
All Exits	256	739,081.94	100.00%	2,887.04	66.05

Table 3.7a: Entry Activi	y Time-series by	V Count and Equit	y Value	(nominal dollars
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This table reports the annual time-series of all CRSP telecom entries by count, market equity, and market equity as a percentage of the industry total market equity. The table also reports annual time-series data of the CRSP telecom entries via IPO and Spin-off, by count, market equity and market equity as a % of the industry total market equity.

	А	nnual Entry A	Activity	Annual IPO Activity Annual Spin-off			Activity		
	Count	Market	Equity (\$ mil)	Count	Market	Equity (\$ mil)	Count	Market 1	Equity (\$ mil)
Year		Entry	% Industry		IPO	% Industry		Spin-off	% Industry
1979	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
1980	5	82.22	0.19%	0	0.00	0.00%	0	0.00	0.00%
1981	5	74.59	0.12%	2	38.95	0.07%	0	0.00	0.00%
1982	1	4.46	0.01%	1	4.46	0.01%	0	0.00	0.00%
1983	9	922.26	1.29%	5	532.74	0.75%	0	0.00	0.00%
1984	14	45,530.40	53.98%	2	37.50	0.04%	7	45,323.58	53.73%
1985	5	74.76	0.07%	2	31.05	0.03%	0	0.00	0.00%
1986	10	854.74	0.65%	9	850.45	0.64%	0	0.00	0.00%
1987	8	686.60	0.52%	6	657.10	0.50%	0	0.00	0.00%
1988	11	1,214.23	0.79%	6	904.59	0.59%	0	0.00	0.00%
1989	7	142.34	0.06%	2	33.21	0.01%	0	0.00	0.00%
1990	4	73.15	0.04%	0	0.00	0.00%	1	16.76	0.01%
1991	11	2,008.07	0.92%	8	1,891.79	0.87%	2	92.75	0.04%
1992	5	349.25	0.14%	3	138.66	0.06%	1	138.09	0.06%
1993	12	15,287.32	4.89%	10	15,156.15	4.84%	0	0.00	0.00%
1994	14	1,067.33	0.37%	10	330.90	0.12%	0	0.00	0.00%
1995	12	3,401.26	0.85%	8	2,995.72	0.75%	0	0.00	0.00%
1996	24	6,495.70	1.76%	18	5,396.69	1.46%	0	0.00	0.00%
1997	12	5,740.86	1.06%	10	4,783.98	0.88%	2	956.89	0.18%
1998	16	43,870.40	5.04%	9	7,052.01	0.81%	3	35,946.51	4.13%
1999	28	27,180.46	2.51%	25	24,439.35	2.25%	2	2,703.07	0.25%
2000	26	31,823.43	4.39%	18	29,324.34	4.04%	1	566.33	0.08%
2001	3	84,085.82	13.55%	0	0.00	0.00%	2	83,397.10	13.44%
2002	6	1,749.18	0.47%	0	0.00	0.00%	0	0.00	0.00%
2003	5	1,058.09	0.25%	2	211.35	0.05%	0	0.00	0.00%
2004	5	9,426.64	2.10%	2	3,428.03	0.77%	0	0.00	0.00%
2005	9	5,030.23	1.20%	6	2,677.71	0.64%	0	0.00	0.00%
2006	5	14,975.60	3.53%	2	2,041.52	0.48%	1	6,208.83	1.47%
2007	5	11,729.45	2.26%	4	11,576.28	2.23%	0	0.00	0.00%
2008	1	112.09	0.03%	0	0.00	0.00%	0	0.00	0.00%
2009	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%

Table 3.7b: Exit Activity Time-series by Count and Equity Value (nominal dollars)

This table reports the annual time-series of all CRSP telecom exits by count, market equity, and market equity as a percentage of the industry total market equity. The table also reports annual time-series data of the CRSP telecom exits via Merger and Chapter 11 Bankruptcy, by count, market equity, and market equity as a % of the industry total market equity.

	Annual Exit Activity		Annual Merger Activity			Annual Bankruptcy Activity			
	Count	Equity V	Value (\$ mil)	Count	Equity V	/alue (\$ mil)	Count	Equity	Value (\$ mil)
Year		Total	% Industry		Total	% Industry		Total	% Industry
1979	1	78.40	0.16%	1	78.40	0.16%	0	0.00	0.00%
1980	3	5,355.43	12.27%	3	5,355.43	12.27%	0	0.00	0.00%
1981	1	3,479.83	5.83%	1	3,479.83	5.83%	0	0.00	0.00%
1982	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
1983	1	102.77	0.14%	1	102.77	0.14%	0	0.00	0.00%
1984	2	75.76	0.09%	1	64.81	0.08%	0	0.00	0.00%
1985	4	87.03	0.08%	1	67.00	0.06%	0	0.00	0.00%
1986	4	134.37	0.10%	3	134.16	0.10%	0	0.00	0.00%
1987	5	65.14	0.05%	2	52.84	0.04%	0	0.00	0.00%
1988	4	137.58	0.09%	2	135.53	0.09%	0	0.00	0.00%
1989	5	192.87	0.08%	1	162.30	0.07%	0	0.00	0.00%
1990	7	8,026.06	4.06%	5	7,983.80	4.04%	0	0.00	0.00%
1991	8	1,371.76	0.63%	4	1,376.21	0.63%	0	0.00	0.00%
1992	4	3,984.53	1.59%	3	3,982.19	1.59%	0	0.00	0.00%
1993	4	8,578.59	2.74%	3	8,578.28	2.74%	0	0.00	0.00%
1994	9	2,286.50	0.80%	8	2,284.76	0.79%	0	0.00	0.00%
1995	7	2,430.35	0.61%	4	2,395.09	0.60%	1	33.50	0.01%
1996	8	54,935.67	14.88%	8	54,935.67	14.88%	0	0.00	0.00%
1997	15	34,866.73	6.44%	10	34,818.74	6.43%	3	36.97	0.01%
1998	15	146,155.24	16.78%	11	146,131.19	16.78%	0	0.00	0.00%
1999	23	165,614.45	15.27%	15	165,489.42	15.26%	3	34.64	0.00%
2000	17	36,594.08	5.05%	10	36,422.77	5.02%	4	110.75	0.02%
2001	29	5,405.70	0.87%	4	3,421.22	0.55%	20	1,921.87	0.31%
2002	20	5,417.08	1.45%	1	17.04	0.00%	12	5,352.45	1.43%
2003	6	1,010.42	0.24%	2	989.02	0.24%	2	12.39	0.00%
2004	4	79,271.72	17.69%	4	79,271.72	17.69%	0	0.00	0.00%
2005	12	43,444.33	10.34%	9	43,361.66	10.32%	1	2.78	0.00%
2006	15	89,590.02	21.14%	7	88,449.53	20.87%	1	976.22	0.23%
2007	9	32,209.00	6.20%	8	32,195.37	6.20%	0	0.00	0.00%
2008	5	6,977.96	2.17%	2	6,948.81	2.16%	0	0.00	0.00%
2009	9	1,186.73	0.35%	5	1,114.00	0.33%	1	36.91	0.01%

Figure 3.2a: Annual Time-series of IPO and Spin-off Activity (count)

This figure presents the annual time-series plot of the number of IPOs and spin-offs for the sample period.



Figure 3.2b: Annual Time-series of Merger and Bankruptcy Activity (count)

This figure presents the annual time-series plot of the number of mergers and bankruptcies for the sample period.





Figure 3.3a: Annual Time-series of IPO Activity (by firm market equity value)

This figure presents the annual time-series plot of the market equity value of the telecom firms involved in IPOs.

Figure 3.3b: Annual Time-series of Merger Activity (by target market equity value)

This figure presents the annual time-series plot of the market equity value of the target firms in mergers.



Table 3.8: Summary of Entry and Exit Activity Pre- & Post-1996 Deregulation (2010 dollars) This table provides a summary breakdown of the total CRSP telecom entry and exit activity by market equity value (2010 dollars) for the pre-1996 [1979 to 1995] sample and the post-1996 [1996 to 2009] sample. The U.S. public telecom entry and exit activity is categorized based on the paths taken by the firms to listing on or delisting from CRSP. 170 entries are via initial public offering (IPO) are identified using data from SDC IPO database and news wires on Lexis Nexis. Entries via spin-off of subsidiaries by public parents, reverse merger (the acquisition of a CRSP listed firm by a private firm), bankruptcy reorganization, and non-IPO public listing are identified and confirmed using information from news wires on Lexis Nexis. 141 exits via merger are identified using data from SDC M&A database and news wires on Lexis Nexis. Exits via Chapter 11 bankruptcy, non-voluntary delist, and voluntary delist and identified from the CRSP delist file, supplemented with information from news wires. *t*(diff) measures the statistical significance of the difference in the post-1996 versus the pre-1996 period for the average IPO, spin-off, merger and bankruptcy in a particular year.

-		Pre-1996 [1979	to 1995]		Post-1996 [1996		
	Count	Market E	quity Value	Count	Count Market Equity Value		
		Total (\$ mil)	Mean (\$ mil)		Total (\$ mil)	Mean (\$ mil)	
IPO	74	36,979.94	499.73	96	114,136.77	1,188.92	2.15
Spin-off	11	95,513.91	8,683.08	11	163,045.23	14,822.29	1.23
All Entries	133	137,027.68	1,030.28	145	303,445.01	2,092.72	
M&A	43	64,021.32	1,488.87	96	848,694.99	8,840.57	3.50
Bankruptcy	1	47.93	47.93	47	10,201.20	217.05	1.58
All Exits	69	63,856.72	925.46	187	861,187.31	4,605.28	

Table 3.9: Characteristics of Entry and Exit Firms Pre- & Post-1996 Deregulation

This table reports summary financial and performance characteristics of the U.S. telecom firms that entered (278) and exited (258) the public market for the pre-1996 [1979 to 1995] and the post-1996 [1996 to 2009] samples. Variables are defined in Panel A and are based on the first available firm data (for entries) and the last available firm data (for exits) on the CRSP/Compustat Merged Fundamentals Annual file. Variables capturing average firm size are measured in means. Variables capturing average firm performance and leverage are measured in medians to minimize the effect of extreme outliers.

Panel A: Variable Definitions									
Variable	Definition								
Market Equity	CRSP Share Price x Shares Outstanding								
Market Asset	Market Equity + Book Assets – Book Equity – Deferred Taxes								
Leverage (market)	1 – Market Equity/Bool	Market Equity/Book Equity 1 Market Equity/Market Assets							
Leverage (book)	1 – Book Equity/Bo	ook Assets							
Sales/Assets	Sales/Book Assets								
Income/Sales	Net Income/Sales								
Cash Flow	Operating Income b	efore Depreciat	ion – Taxes						
Panel B: Financial and Operating Cha	aracteristics	< F4.050 4.0051		D 40	0.4 14 0.0 4 0.00				
	Pre-1990	5 [1979 to 1995]		Post-19	96 [1996 to 200	19]			
Variable	All Firms	Entries	Exits	All Firms	Entries	Exits			
CRSP Sample Size	1001	133	69	1185	145	187			
CRSP/Compustat Sample Size	909	123	57	1116	138	182			
<u>Size Measures (\$millions)</u>									
Market Equity	3,093.26	664.83	451.47	6,810.31	1,743.61	3,489.23			
Book Assets	5,280.93	1224.95	647.42	9,003.31	1,795.70	3,840.60			
Book Equity	1,839.03	490.35	131.01	2,848.72	713.23	1,179.30			
Market Assets	5,992.83	1242.39	885.36	12,198.25	2,662.60	5,919.15			
Sales	2,897.40	518.64	292.48	3,958.93	567.38	1,667.60			
Net Income	188.22	50.80	6.61	107.30	85.29	-133.67			
Cash Flow	912.43	200.36	85.62	1,284.95	82.79	440.91			
Capital Expenditures	583.46	122.87	70.46	745.10	160.34	372.34			
R&D	45.30	0.40	0.08	9.79	0.70	3.32			
Employees ('000)	26.30	5.29	2.61	11.53	1.90	5.53			
Performance Measures									
Market/Book Equity	1.73	2.60	1.78	2.08	2.78	1.14			
Sales/Assets	0.51	0.43	0.60	0.51	0.32	0.58			
Income/Sales	0.04	-0.06	-0.16	-0.09	-0.27	-0.21			
Income/Assets	0.06	-0.02	-0.04	0.00	-0.05	-0.10			
Cash Flow/Sales	0.22	0.03	0.03	0.15	-0.11	0.00			
Cash Flow/Assets	0.13	0.02	0.02	0.08	-0.03	0.00			
Capital Expenditures/Assets	0.10	0.09	0.09	0.09	0.10	0.09			
R&D/Assets	0.00	0.00	0.00	0.00	0.00	0.00			
<u>Leverage Measures</u>									
Leverage (market)	0.48	0.23	0.41	0.45	0.30	0.53			
Leverage (book)	0.65	0.57	0.74	0.68	0.60	0.79			

Table 3.10a: Competition, Performance and Valuation Before & After 1996 Deregulation

This table presents averages of measures of competition, performance and valuation 5 years before and 5 years after the 1996 deregulation. Industry turnover is the sum (count or value) of entry and exit divided by the sum (count or value) of firms in the industry each year. Herfindahl-Hirschman Index is the sum of the squared market shares of firms in the industry each year. Return on Assets (ROA) is measured each year as the median of (net income + interest)/book value of assets)). Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. Inter-Firm Dispersion in Cash Flow Shocks is measures each year as the cross-sectional standard deviation of firms' quarterly cash flow shocks. Inter-Firm Dispersion in ROS is the cross-sectional standard deviation of firms' return on sales (cash flow/sales). M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) and V/B (proxy for fundamental value-to-book) are computed using the Rhodes-Kropf et al. (2005) M/B decomposition. *t*(diff) is the *t*-statistic of the difference in the means.

	5-Year Averages				
	Before	After	% Change	<i>t</i> (diff)	
	1991 to 1995	1996 to 2000			
Panel A: Competition					
Entry Activity (count)					
Total Entry	10.80	21.20	96%	5.04	
IPO	7.80	16.00	105%	3.11	
Spin-off	0.60	1.60	167%	1.20	
<u>Exit Activity (count)</u>					
Total Exit	6.40	15.60	144%	3.11	
M&A	4.40	10.80	145%	4.49	
Bankruptcy	0.20	2.00	900%	2.45	
Industry Turnover					
Turnover (count)	0.21	0.33	57%	3.67	
Turnover (value)	0.03	0.15	400%	2.48	
<u>Market Power</u>					
Herfindahl-Hirschman Index	0.14	0.11	-21%	-8.84	
Return on Assets (ROA)	0.11	0.06	-45%	-9.18	
Panel B: Performance & Valuation					
Performance					
Economic Shock Index (Harford (2005))	0.19	0.31	63%	4.73	
Inter-Firm Dispersion in Cash Flow Shocks	0.10	0.93	830%	1.85	
Inter-Firm Dispersion in ROS	0.26	0.32	23%	6.35	
Valuation					
M/B (log)	1.08	1.05	-3%	-0.25	
Valuation Error (Rhodes-Kropf et al. (2005))	0.12	-0.07	-158%	-1.84	
V/B (Rhodes-Kropf et al. (2005))	0.96	1.12	17%	1.12	

Table 3.10b: Competition, Performance and Valuation Before & After 1996 Deregulation

This table presents averages of measures of competition, performance and valuation 10 years before and 10 years after the 1996 deregulation. Industry turnover is the sum (count or value) of entry and exit divided by the sum (count or value) of firms in the industry each year. Herfindahl-Hirschman Index is the sum of the squared market shares of firms in the industry each year. Return on Assets (ROA) is measured each year as the median of (net income + interest)/book value of assets)). Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. Inter-Firm Dispersion in Cash Flow Shocks is measured each year as the cross-sectional standard deviation of firms' quarterly cash flow shocks. Inter-Firm Dispersion in ROS is the cross-sectional standard deviation of firms' return on sales (cash flow/sales). M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) and V/B (proxy for fundamental value-to-book) are computed using the Rhodes-Kropf et al. (2005) M/B decomposition. *t*(diff) is the *t*-statistic of the difference in the means.

	10-Year Averages				
	Before	After	% Change	<i>t</i> (diff)	
	1986 to 1995	1996 to 2005			
Panel A: Competition					
<u>Entry Activity (count)</u>					
Total Entry	9.40	13.40	43%	1.09	
IPO	6.20	9.00	45%	0.81	
Spin-off	0.40	1.00	150%	1.50	
<u>Exit Activity (count)</u>					
Total Exit	5.70	15.00	163%	3.05	
M&A	3.50	7.40	111%	2.04	
Bankruptcy	0.10	4.50	4400%	2.12	
Industry Turnover					
Turnover (count)	0.20	0.29	45%	1.95	
Turnover (value)	0.02	0.12	500%	3.53	
Market Power					
Herfindahl-Hirschman Index	0.14	0.12	-14%	-5.85	
Return on Assets (ROA)	0.10	0.07	-30%	-5.49	
Panel B: Performance & Valuation					
<u>Performance</u>					
Economic Shock Index (Harford (2005))	0.19	0.29	53%	3.49	
Inter-Firm Dispersion in Cash Flow Shocks	0.13	0.60	362%	2.02	
Inter-Firm Dispersion in ROS	0.27	0.29	7%	1.46	
Valuation					
M/B (log)	1.03	0.79	-23%	-1.95	
Valuation Error (Rhodes-Kropf et al. (2005))	0.08	-0.05	-163%	-1.21	
V/B (Rhodes-Kropf et al. (2005))	0.95	0.84	-12%	-0.70	

Table 3.10c: Competition, Performance and Valuation Post 1996 Deregulation

This table presents averages of measures of competition, performance and valuation for two 5 year periods poste 1996 deregulation. Industry turnover is the sum (count or value) of entry and exit divided by the sum (count or value) of firms in the industry each year. Herfindahl-Hirschman Index is the sum of the squared market shares of firms in the industry each year. Return on Assets (ROA) is measured each year as the median of (net income + interest)/book value of assets)). Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. Inter-Firm Dispersion in Cash Flow Shocks is measures each year as the cross-sectional standard deviation of firms' quarterly cash flow shocks. Inter-Firm Dispersion in ROS is the cross-sectional standard deviation of firms' return on sales (cash flow/sales). M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) and V/B (proxy for fundamental value-to-book) are computed using the Rhodes-Kropf et al. (2005) M/B decomposition. *t*(diff) is the *t*-statistic of the difference in the means.

	5-Year Averages Post Deregulation					
	1 st 5 years	2 nd 5 years				
	1996 to 2000	2001 to 2005	% Change	<i>t</i> (diff)		
Panel A: Competition						
<u>Entry Activity (count)</u>						
Total Entry	21.20	5.60	-74%	-4.94		
IPO	16.00	2.00	-88%	-4.86		
Spin-off	1.60	0.40	-75%	-1.40		
<u>Exit Activity (count)</u>						
Total Exit	15.60	14.40	-8%	-0.10		
M&A	10.80	4.00	-63%	-3.21		
Bankruptcy	2.00	7.00	250%	1.15		
<u>Industry Turnover</u>						
Turnover (count)	0.33	0.24	-27%	-0.94		
Turnover (value)	0.15	0.10	-33%	-0.84		
<u>Market Power</u>						
Herfindahl-Hirschman Index	0.11	0.13	18%	4.20		
Return on Assets (ROA)	0.06	0.07	17%	0.65		
Panel B: Performance & Valuation						
Performance						
Economic Shock Index (Harford, 2005)	0.31	0.28	-10%	-0.55		
Inter-Firm Dispersion in Cash Flow Shocks	0.93	0.26	-72%	-1.36		
Inter-Firm Dispersion in ROS	0.32	0.27	-16%	-2.33		
Valuation						
M/B (log)	1.05	0.53	-50%	-3.74		
Valuation Error (Rhodes-Kropf et al., 2005)	-0.07	-0.02	71%	0.55		
V/B (Rhodes-Kropf et al., 2005)	1.12	0.55	-51%	-5.10		

Table 3.11: Summary Statistics and Correlations of Explanatory Variables

Panel A: Summary Statistics

V/B (log)

This table presents summary statistics for the explanatory variables employed in the regression analysis for the period from 1980 to 2009. The annual data is computed from firm-year observations. Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. ENTRY is the number of new telecom firms listed on CRSP each year. DISP ROS is the cross-sectional standard deviation of return on sales (cash flow/sales). To compute DISP ROS I exclude firm-year observations where ROS is greater than 1 or less than -1, in order to remove the influence of extreme values. DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) and V/B (proxy for fundamental value-to-book) are computed using the Rhodes-Kropf et al. (2005) M/B decomposition.

6							
	Mean	Median	Max	Min	Std. De	ev. Annua	al Obs.
ECON SHOCK INDEX	0.21	0.18	0.45	0.09	0.0	08	31
ENTRY	8.97	7.00	28.00	0.00	6.9	96	31
DISP CFLOW SHOCK	0.39	0.18	2.58	0.06	0.5	58	31
DISP ROS	0.26	0.25	0.37	0.14	0.0	05	31
M/B (log)	0.79	0.79	1.44	-0.13	0.3	34	31
IND ERROR	-0.11	-0.12	0.49	-1.15	0.3	31	31
V/B (log)	0.90	0.85	1.56	0.17	0.3	35	31
Panel B: Correlations							
	ECON SHOCK	ENTRY	DISP CFLOW	DISP	M/B	IND	V/B
	INDEX		SHOCK	ROS	(log)	ERROR	(log)
ECON SHOCK INDEX	1.00						
ENTRY	0.40	1.00					
DISP CFLOW SHOCK	0.45	0.40	1.00				
DISP ROS	0.69	0.68	0.51	1.00			
M/B (log)	0.09	0.52	0.24	0.43	1.00		
IND ERROR	0.16	0.24	0.01	0.27	0.43	1.00	

0.30

0.23

0.18

0.60

-0.47

1.00

-0.06

96
Table 3.12a: Regression of Annual Merger Activity (Count) on Explanatory Variables

This table presents the results from regressions of annual merger count on explanatory variables for the 1980 to 2009 sample period. Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. ENTRY is the number of new telecom firms listed on CRSP each year. DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of return on sales (cash flow/sales). To compute DISP ROS I exclude firm-year observations where ROS is greater than 1 or less than -1, in order to remove the influence of extreme values. M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) and V/B (proxy for fundamental value-to-book) are computed using the Rhodes-Kropf et al. (2005) M/B decomposition. Statistical significance at the 1% and 5% levels are denoted by *** and **, respectively.

Panel A: Dependent Variable = Merger Activity (Count)										
Explanatory Variables	Model I	Model II	Model III	Model IV	Model V					
ECON SHOCK INDEX	20.17***	20.86***			10.60					
	(2.74)	(2.78)			(1.14)					
ENTRY			0.31***		0.32***					
			(3.50)		(3.02)					
DISP CFLOW SHOCKS			1.99**		1.77*					
			(2.12)		(1.70)					
DISP ROS				38.37***	-14.19					
				(2.66)	(-0.72)					
M/B	2.64									
	(1.51)									
IND ERROR		1.75	-1.28	0.02	-0.78					
		(0.79)	(-0.63)	(0.01)	(-0.36)					
V/B		3.24*	-0.89	1.32	-0.16					
		(1.68)	(-0.49)	(0.63)	(-0.08)					
Constant	-1.75	-2.52	1.60	-6.68	2.53					
	(-0.85)	(-1.08)	(1.11)	(-1.84)	(0.66)					
R-Square	0.27	0.29	0.53	0.28	0.56					
Adj. R-Square	0.22	0.21	0.46	0.20	0.44					
Observations	31	31	31	31	31					

Table 3.12b: Regression of Annual Merger Activity (Value) on Explanatory Variables

This table presents the results from regressions of annual merger value (market equity value of targets) on explanatory variables for the 1980 to 2009 sample period. Economic Shock Index (Harford (2005)) is measured each year as the first principal component of the median absolute change in seven economic variables: sales/assets, net income/sales, capital expenditures/assets, R&D/assets, ROA, sales growth, and employee growth. ENTRY is the number of new telecom firms listed on CRSP each year. DISP CFLOW SHOCKS is the cross sectional standard deviation of firms' quarterly cash flow shocks, winsorized and scaled by quarter-end share price. DISP ROS is the cross-sectional standard deviation of return on sales (cash flow/sales). To compute DISP ROS I exclude firm-year observations where ROS is greater than 1 or less than -1, in order to remove the influence of extreme values. M/B (log) is the average market-to-book equity ratio. Valuation Error (proxy for industry misvaluation) and V/B (proxy for fundamental value-to-book) are computed using the Rhodes-Kropf et al. (2005) M/B decomposition. Statistical significance at the 1% and 5% levels are denoted by *** and **, respectively.

Panel A: Dependent Variable = Merger Activity (Value)										
Explanatory Variables	Model I	Model II	Model III	Model IV	Model V					
ECON SHOCK INDEX	197.53*	215.83*			-18.28					
	(1.74)	(1.90)			(-0.17)					
ENTRY (count)			2.25**		2.98**					
			(2.16)		(2.42)					
DISP CFLOW SHOCKS			60.13***		65.66***					
			(5.46)		(5.37)					
DISP ROS				455.58	-194.00					
				(2.14)**	(-0.83)					
M/B	46.75*									
	(1.74)									
IND ERROR		22.93	-8.93	0.96	-4.25					
		(0.69)	(-0.37)	(0.03)	(-0.17)					
V/B		61.95**	9.33	38.93	9.31					
		(2.11)	(0.43)	(1.26)	(0.40)					
Constant	-47.42	-67.37	-22.62	-123.32	23.50					
	(-1.50)	(-1.91)	(-1.33)	(-2.30)	(0.52)					
R-Square	0.19	0.23	0.70	0.26	0.71					
Adj. R-Square	0.13	0.15	0.65	0.18	0.64					
Observations	31	31	31	31	31					

Table 3.13: 1996 Incumbents tracked through 2001 and 2006 – Survivors and Exits

This table presents averages of the ex-ante and ex-post financial and performance characteristics of 1996 incumbents. The CRSP sample size lists the number of domestic public telecom firms (three-digit SIC Code 481) that were incumbents at the beginning of 1996, and that then survive (exit) through (before) 2001 and 2006. The Compustat sample size is the number of telecom firms for which there is available financial data. The first column shows the financial and performance characteristics, measured using 1995 data, of the incumbents. The second and third columns show the ex-ante (1995) and ex-post (2000) financial and performance data of the 1996 incumbents that survive as of the year 2000. The fourth and fifth columns show the ex-ante (1995) and ex-post (2005) financial and performance data of the 1996 incumbents that survive as of the year 2005. The sixth and seventh columns show the ex-ante (1995) financial and performance data of the 1996 incumbents that exit between [1996 & 2001) and between [2000 & 2006). The size measures are in means, while the performance and leverage measures are in medians.

	Incumbents	Survivors '01		Survivors '06		Exits [96 to 01)	Exits [01 to 06)
		Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Ante
Financial Data Year	1995	1995	2001	1995	2006	1995	1995
CRSP Sample Size	90	41	41	22	22	49	19
Compustat Sample Size	87	39	39	20	21	48	19
<u>Size Measures (\$millions)</u>							
Market Equity	5,020.68	6,507.23	13,054.05	6,540.44	18,739.27	3,837.51	6,468.50
Book Assets	4,373.41	5,597.21	18,150.66	5,419.72	31,890.34	3,399.37	5,804.27
Book Equity	1,246.68	1,583.53	5,416.03	1,825.23	12,566.44	978.57	1,301.55
Market Assets	7,938.92	10,221.72	24,096.49	9,857.22	34,968.06	6,122.00	10,646.96
Sales	2,761.54	3,847.93	6,831.43	3,142.23	11,338.52	1,896.86	4,671.25
Net Income	-30.66	19.44	15.70	45.89	976.01	-70.53	-11.43
Cash Flow	843.84	1,050.87	2,596.91	1,202.63	3,720.10	679.07	873.83
Capital Expenditures	465.05	528.08	1,789.56	611.65	1,907.43	412.75	430.58
R&D	51.80	104.95	8.57	0.16	10.90	9.50	227.21
Employees ('000)	12.45	16.61	23.45	14.99	35.07	9.15	18.61
<u>Performance Measures</u>							
Market/Book Equity	2.68	2.56	1.32	2.33	2.11	3.12	2.74
Sales/Assets	0.55	0.54	0.46	0.56	0.52	0.57	0.36
Income/Sales	-0.02	0.03	-0.01	0.06	0.06	-0.07	-0.11
Income/Assets	0.01	0.05	0.02	0.07	0.08	-0.01	-0.02
Cash Flow/Sales	0.15	0.25	0.26	0.34	0.32	0.12	0.03
Cash Flow/Assets	0.10	0.13	0.10	0.21	0.15	0.08	0.04
Capital Exp/Assets	0.09	0.08	0.10	0.08	0.08	0.09	0.08
R&D/Assets	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<u>Leverage Measures</u>							
Leverage (market)	0.35	0.36	0.50	0.32	0.39	0.34	0.39
Leverage (book)	0.63	0.59	0.81	0.59	0.58	0.65	0.60

Table 3.14: 1996 Incumbents tracked through 2001 and 2006 - Exits

This table presents averages of the ex-ante financial and performance characteristics of 1996 incumbents that exited from CRSP between [1996 to 2001) and between [2001 to 2006) via merger, bankruptcy and non-voluntary delisting (other). The CRSP sample size lists the number of the CRSP exits by exit type within each time interval. The Compustat sample size is the number of telecom firms for which there is available financial data. Financial and performance characteristics are measured using 1995 data. The size measures are means, while the performance and leverage measures are medians.

	I	Exits [1996 to 2001)	Ex	Exits [2001 to 2006)			
	Merger	Bankruptcy	Other	Merger	Bankruptcy	Other	
Financial Data Year	1995	1995	1995	1995	1995	1995	
CRSP Sample Size	34	6	9	5	9	4	
Compustat Sample Size	32	6	9	5	9	3	
<u>Size Measures (\$millions)</u>							
Market Equity	5737.45	647.15	32.14	21225.35	989.11	89.17	
Book Assets	5074.08	521.09	18.36	18949.15	966.98	12.62	
Book Equity	1466.52	103.64	8.63	4007.63	336.93	6.46	
Market Assets	9140.49	1063.65	41.67	35015.77	1611.08	95.33	
Sales	2856.90	208.51	28.79	15986.61	405.47	21.56	
Net Income	-97.86	-34.06	-0.89	-40.68	2.33	-0.40	
Cash Flow	1032.59	39.12	1.28	2961.40	93.47	0.56	
Capital Expenditures	593.34	80.04	1.46	1345.13	101.83	0.76	
R&D	14.51	0.00	0.11	816.60	0.18	1.15	
Employees ('000)	13.85	1.29	0.15	75.62	1.36	0.09	
<u>Performance Measures</u>							
Market/Book Equity	3.52	3.03	2.44	4.50	2.37	15.01	
Sales/Assets	0.55	0.66	1.33	0.39	0.23	2.48	
Income/Sales	-0.02	-0.17	-0.14	0.00	-0.41	-0.01	
Income/Assets	0.02	-0.05	-0.19	0.02	-0.04	-0.01	
Cash Flow/Sales	0.22	0.01	-0.07	0.19	-0.24	0.02	
Cash Flow/Assets	0.10	0.01	-0.13	0.13	-0.05	0.01	
Capital Expenditures/Assets	0.10	0.06	0.04	0.10	0.07	0.07	
R&D/Assets	0.00	0.00	0.00	0.00	0.00	0.00	
<u>Leverage Measures</u>							
Leverage (market)	0.34	0.39	0.23	0.39	0.37	0.39	
Leverage (book)	0.66	0.75	0.61	0.52	0.48	0.81	

Table 3.15a: 1996 Incumbents tracked through 2001 - Survivors and Non-merger Exits

This table presents ex-ante financial and performance characteristics of 1996 incumbents. The CRSP sample size lists the number of domestic public telecom firms (three-digit SIC Code 481) that were incumbents at the beginning of 1996, and that then survive (exit via bankruptcy or non-voluntary delisting, i.e. non-merger exits) through (before) 2001. The Compustat sample size is the number of telecom firms for which there is available financial data. Financial and performance characteristics are measured using 1995 data. Observations with cash flow/sales or cash flow/assets larger than 1 or smaller than -1 are set equal to missing. The difference column (Diff) reports the difference in means between the 1996 incumbents that survive through 2001 and that exit via non-merger before 2001. The t(diff) refers to the null hypothesis that the difference between the two means is equal to zero.

	Survivors [1996 to 2001)		Non-merg	Non-merger Exits [1996 to 2001)				
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	Diff	<i>t</i> (diff)
CRSP Sample Size	41	41	41	15	15	15		
CRSP/Compustat Sample Size	35	35	35	15	15	15		
<u>Size Measures (\$millions)</u>								
Market Equity	7,207.29	279.72	19,302.76	278.14	33.06	623.15	6,929.14	2.12
Book Assets	6,195.44	340.61	16,045.58	219.46	26.04	404.82	5,975.98	2.20
Book Equity	1,745.93	155.24	3,628.29	46.64	5.90	146.96	1,699.29	2.77
Market Assets	11,323.41	474.52	30,900.40	450.46	50.69	965.60	10,872.95	2.08
Sales	4,286.41	162.60	13,676.13	100.68	20.75	163.72	4,185.73	1.81
Net Income	26.58	6.53	426.31	-14.16	-2.63	22.89	40.74	0.56
Cash Flow	1,174.80	21.49	2,986.63	16.41	0.05	52.48	1,158.38	2.29
Capital Expenditures	572.66	29.96	1,350.88	25.64	0.71	82.78	547.03	2.39
R&D	116.89	0.00	680.18	0.07	0.00	0.24	116.83	1.02
Employees ('000)	18.51	1.00	53.11	0.60	0.19	1.16	17.91	1.99
Performance Measures								
Market/Book Equity	4.46	2.61	5.17	2.20	2.44	9.51	2.27	0.87
Sales/Assets	0.81	0.55	0.79	1.02	0.95	0.66	-0.21	-0.99
Income/Sales	-0.07	0.05	0.37	-0.24	-0.17	0.28	0.16	1.72
Income/Assets	0.03	0.05	0.13	-0.16	-0.11	0.22	0.19	3.06
Cash Flow/Sales	0.17	0.27	0.30	-0.07	0.01	0.31	0.24	2.52
Cash Flow/Assets	0.12	0.14	0.14	-0.07	0.00	0.26	0.19	2.72
Capital Expenditures/Assets	0.08	0.08	0.04	0.09	0.05	0.08	-0.01	-0.31
.R&D/Assets	0.01	0.00	0.03	0.03	0.00	0.11	-0.02	-0.73
<u>Leverage Measures</u>								
Leverage (market)	0.35	0.32	0.18	0.34	0.34	0.16	0.01	0.23
Leverage (book)	0.58	0.61	0.19	0.62	0.68	0.27	-0.03	-0.44

Table 3.15b: 1996 Incumbents tracked through 2001 - Survivors and Merger Exits

This table presents ex-ante financial and performance characteristics of 1996 incumbents. The CRSP sample size lists the number of domestic public telecom firms (three-digit SIC Code 481) that were incumbents at the beginning of 1996, and that then survive (exit via merger) through (before) 2001. The Compustat sample size is the number of telecom firms for which there is available financial data. Financial and performance characteristics are measured using 1995 data. Observations with cash flow/sales or cash flow/assets larger than 1 or smaller than -1 are set equal to missing. The difference column (Diff) reports the difference in means between the 1996 incumbents that are still alive in 2001 and those that exit via merger before 2001. The *t*(diff) refers to the null hypothesis that the difference between the two means is equal to zero.

	Survivors [1996 to 2001)		Merger Exits [1996 to 2001)					
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	Diff	<i>t</i> (diff)
Financial Data Year	1995	1995	1995	1995	1995	1995		
CRSP Sample Size	41	41	41	34	34	34		
Compustat Sample Size	35	35	35	30	30	30		
<u>Size Measures (\$millions)</u>								
Market Equity	7,207.29	279.72	19,302.76	6,099.31	372.57	10,498.31	1,107.98	0.29
Book Assets	6,195.44	340.61	16,045.58	5,387.36	291.34	9,469.12	808.07	0.25
Book Equity	1,745.93	155.24	3,628.29	1,551.67	77.61	2,620.55	194.26	0.25
Market Assets	11,323.41	474.52	30,900.40	9,722.69	584.83	17,163.63	1,600.71	0.26
Sales	4,286.41	162.60	13,676.13	3,047.22	206.95	5,481.96	1,239.19	0.49
Net Income	26.58	6.53	426.31	-104.13	-1.40	798.09	130.71	0.80
Cash Flow	1,174.80	21.49	2,986.63	1,102.09	27.45	2,148.48	72.71	0.11
Capital Expenditures	572.66	29.96	1,350.88	632.87	36.33	1,125.51	-60.20	-0.20
R&D	116.89	0.00	680.18	15.24	0.00	54.91	101.66	0.88
Employees	18.51	1.00	53.11	14.80	1.20	27.05	3.71	0.36
<u>Performance Measures</u>								
Market/Book Equity	4.46	2.61	5.17	4.37	3.52	8.45	0.09	0.05
Sales/Assets	0.81	0.55	0.79	0.75	0.57	0.58	0.06	0.34
Income/Sales	-0.07	0.05	0.37	-0.10	-0.02	0.20	0.02	0.34
Income/Assets	0.03	0.05	0.13	-0.01	0.02	0.09	0.03	1.27
Cash Flow/Sales	0.17	0.27	0.30	0.18	0.22	0.26	0.00	-0.04
Cash Flow/Assets	0.12	0.14	0.14	0.12	0.10	0.11	0.01	0.22
Capital Expenditures/Assets	0.08	0.08	0.04	0.12	0.10	0.08	-0.04	-2.44
R&D/Assets	0.01	0.00	0.03	0.00	0.00	0.00	0.01	1.46
Leverage Measures								
Leverage (market)	0.35	0.32	0.18	0.38	0.36	0.22	-0.04	-0.69
Leverage (book)	0.58	0.61	0.19	0.67	0.66	0.32	-0.09	-1.39

Table 3.16: 1996 Incumbents tracked through 2001 – Acquirers and Targets

This table presents averages of the ex-ante financial and performance characteristics of merger targets and acquirers between [1996 and 2001) that were among the 1996 incumbents. 32 of the 1996 incumbents become merger targets and were acquired during the [1996 to 2001) period. 1 acquisition was by a private acquirer, 5 by foreign acquirers, 6 by new entrants, and 18 by 10 of the 1996 incumbents. The table compares the financial and performance characteristics of the 18 targets to that of their 10 acquirers, weighted by number of acquisitions, using 1995 data. The difference column (Diff) reports the difference in means between the acquirers and the targets. The *t*(diff) refers to the null hypothesis that the difference between the two means is equal to zero.

	Acquirers [1996 to 2001)		Targets [1996 to 2001)					
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	Diff	<i>t</i> (diff)
CRSP Sample Size	18	18	18	18	18	18		
CRSP/Compustat Sample Size	17	17	17	18	18	18		
<u>Size Measures (\$millions)</u>								
Market Equity	19,104.26	6,811.82	25,600.19	7,641.07	804.93	12,457.48	11,463.19	1.67
Book Assets	14,505.97	6,634.57	21,066.19	7,096.35	491.60	11,225.87	7,409.62	1.29
Book Equity	3,726.94	2,187.27	4,353.39	1,875.55	119.97	3,054.89	1,851.40	1.45
Market Assets	29,225.99	11,232.94	41,059.04	12,583.43	1,215.02	20,454.98	16,642.56	1.50
Sales	9,915.87	3,639.88	18,319.74	4,149.95	181.74	6,527.75	5,765.91	1.23
Net Income	41.83	1.31	793.28	-256.65	-10.40	966.85	298.48	1.00
Cash Flow	2,992.31	987.31	3,868.34	1,506.34	34.14	2,531.28	1,485.96	1.34
Capital Expenditures	1,346.79	506.87	1,657.10	857.21	49.41	1,298.20	489.58	0.97
R&D	240.18	0.00	960.71	24.01	0.00	69.34	216.17	0.93
Employees	41.05	7.50	69.88	19.82	1.33	31.44	21.23	1.15
Performance Measures								
Market/Book Equity	3.63	3.11	1.54	5.85	3.40	7.73	-2.22	-1.19
Sales/Assets	0.60	0.56	0.30	0.52	0.53	0.18	0.09	1.03
Income/Sales	-0.02	0.00	0.18	-0.14	-0.13	0.17	0.12	2.00
Income/Assets	0.03	0.02	0.06	-0.03	-0.03	0.09	0.06	2.41
Cash Flow/Sales	0.29	0.27	0.14	0.24	0.26	0.18	0.05	1.01
Cash Flow/Assets	0.18	0.22	0.09	0.13	0.12	0.09	0.05	1.67
Capital Expenditures/Assets	0.12	0.11	0.06	0.13	0.11	0.09	-0.02	-0.64
R&D/Assets	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.69
<u>Leverage Measures</u>								
Leverage (market)	0.31	0.32	0.10	0.45	0.40	0.22	-0.14	-2.37
Leverage (book)	0.60	0.67	0.18	0.74	0.71	0.35	-0.14	-1.51

CHAPTER 4

TELECOMMUNICATIONS DEREGULATION AND THE MOTIVES FOR MERGERS

4.1 Introduction

On the motives behind the rise and cluster of merger activity following the passage of the Telecommunications Act of 1996, the merger literature suggests a number of alternative theories. The evidence that mergers after telecommunications deregulation generate positive announcement abnormal returns to the stockholders of the merging firms (combined bidder and target returns) is consistent with both collusion and efficiency theories. The negative announcement abnormal returns to bidders suggest hubris (Roll, 1986) as a possible motive. Regulators did raise concerns regarding the potential collusive effects of the mergers, e.g. Nynex/Bell Atlantic, enabled by the deregulation. The increase in competition following deregulation may well have driven the increase in merger activity by generating incentives for telecom firms to seek out production efficiencies or to collude. In this paper, I examine these alternative theories by studying the announcement abnormal returns to rivals of merging firms using an approach pioneered by Eckbo (1983) and Stillman (1983).

Similar to earlier findings in Eckbo (1983, 1985) and Mitchell and Mulherin (1996), I find that merger announcements produce positive abnormal stock returns on average for rivals. As in the period prior to telecom deregulation, the returns to rivals are positive in the post-deregulation period and exhibit substantial cross-sectional dispersion. The plausibility of collusion via mergers could explain the positive returns to rivals post-deregulation but not the cross-sectional dispersion. Because effective collusion enables the firms remaining in the market after merger to raise product prices or reduce output or increase coordination, the collusion hypothesis predicts that rivals on average should earn positive abnormal returns around merger announcement. Rivals earn positive abnormal returns because the potential gains to industry profitability from collusion via merger are expected to be distributed across the entire set of competitors. But Eckbo (1983, 1985, 1992), Eckbo and Wier (1985), and Stillman (1983) reject this hypothesis.

Efficiency theories provide a wide range of possible motives, including the realization of technological complementarities, replacement of inefficient management, utilization of unused corporate tax credits, and avoidance of bankruptcy costs (see Steiner 1975). As a result, efficiency theories do not restrict the sign of the abnormal returns to rivals. If a telecom merger following deregulation results in a more competitive firm then rivals on average should earn negative abnormal returns on merger announcement – the competitive hypothesis. But the result that rivals on average earn positive abnormal returns is not consistent with this competitive hypothesis. If, given the influence of technological changes and consumers demand for a vertically integrated product package, the announcement of a proposed efficient merger signals potential synergies between rivals and subsequent bidders and an increased probability of mergers, then rivals on average should earn positive abnormal returns on merger announcement – the anticipation hypothesis.

According to the anticipation hypothesis, revisions to rivals' stock price occur because of changes in the perceived probability of acquisition attempts (Song and Walkling, 2000). Deregulation was spurred by technological changes, which had begun to dramatically alter the way communications services are created and supplied as consumers increasingly shopped for branded, integrated packages of services (Maloney and McCormick, 1995). Large-scale firms can offer such "one-stop shopping" either on their own by integrating into disparate product lines via mergers or by tying together the offerings of independent service providers (Hazlett, 1999). Technological changes affect the probability of acquisition attempts. Deregulation, by removing "artificial product and geographical boundaries" on the scope of firms' activities and barriers to mergers, also affects

the probability of acquisition attempts. The initial merger announcement following telecom deregulation provides a setting to test for merger-specific information revealed about other likely targets and bidders as firms pursue scale and a vertically integrated product offering.

The period following telecom deregulation is a more frequent bidding environment that could be termed a "mergers possible state" (see model in Rhodes-Kropf and Robinson, 2008). Anticipation is likely to lead to adjusted stock prices in a "mergers possible state" (Cai, Song and Walkling, 2011). The initial merger announcement in this period following deregulation should be a relatively less anticipated bid with respect to the particular participants. If the market's reaction to the initial merger announcement conveys merger-specific information about likely future targets and bidders, abnormal returns should be higher for rivals expected to become subsequent targets. Previewing the results, I find that on the initial merger announcement the mean abnormal return to rivals who become subsequent targets within one year of the merger announcement is significantly higher than the mean abnormal return to rivals who do not become subsequent targets or bidders. The anticipation hypothesis, in contrast to the collusion hypothesis, helps explain some of the cross-sectional dispersion in abnormal returns to rivals on the initial merger announcement.

The full data consists of 138 merger observations and 11,768 rival observations over the period from 1979 to 2009. This period roughly centers on the 1996 deregulation, which provides for a test of possible motives – collusion, efficiency as well as hubris – for mergers clustering in an industry following economic shocks from deregulation and technological changes. First, I compare the abnormal returns to rivals in the periods before and after telecom deregulation and find that the positive mean abnormal return to rivals of merging firms in the post-deregulation period is not significantly different from the mean abnormal return to rivals in the pre-deregulation period. If the positive abnormal returns to rivals are indicative of the collusive effects of telecom mergers, the data suggests that any collusive effects of telecom mergers do not increase in the post-deregulation

period. The announcement abnormal returns to rivals who become subsequent targets suggest a lesser degree of surprise on average about acquisitions in the post-deregulation period.

Second, I analyze the abnormal returns to rivals on the initial merger announcement following deregulation to draw inferences on the motives for mergers in a more competitive bidding environment. I find that although the combined abnormal return to the merging firms on the initial merger announcement involving two Baby Bells – Pacific Telesis Group and SBC Communications Inc. – is positive and consistent with collusion and the two efficiency hypotheses treated in this paper, the abnormal return to the bidder is negative. This presents hubris as a possible motive, even in the midst of potential synergies.

I find that, on the initial merger announcement following deregulation, the mean abnormal return to rivals of the merging firms is positive, which supports the collusion and anticipation hypotheses but not the competitive hypothesis that the merging firms will be replaced by a new entity more competitive than rivals. The positive mean abnormal return to rivals also does not lend support to the hubris hypothesis, unless perhaps the merger results in a new entity that will be less competitive than rivals. The significantly larger positive mean abnormal return to rivals who become subsequent targets within one year of the initial merger announcement does not support the collusion and hubris hypotheses, but supports the anticipation hypothesis that the initial merger signals that rivals will become acquisition targets amidst opportunities for potential synergies.

Third, to gain further insights into the influence of anticipation in merger announcement abnormal returns following deregulation, I analyze the abnormal returns associated with the second and third merger announcements following deregulation. The abnormal return patterns associated with these subsequent merger announcements add insights into the stock price-adjustment effect of anticipation in bidding activity. 1) The market appears to be able to extract merger-specific information from bid announcements to distinguish between subsequent targets/bidders and subsequent non-targets/non-bidders, but does not appear to be able to predict the first target/bidder. 2) A substantial amount of the bidding activity that occurred following deregulation in the telecommunications industry is anticipated by the market.

The third merger announcement involving Nynex Corp and Bell Atlantic, another couple of the Baby Bells, occurred in less than a month of the initial merger announcement and was anticipated by the market. The announcement abnormal return patterns do not support the FCC's view that the Nynex/Bell Atlantic merger would facilitate the exercise of unilateral power by the merged entity and enhance risk of coordinated pricing. The patterns show little evidence that the merger would have had collusive or anticompetitive effects, but support anticipation of potential mergers between the remaining Baby Bells and subsequent bidders. Anticipation, amidst potential synergies and an industry trend towards scale and a vertically integrated product package in a more competitive post-deregulation environment, helps explain why bidders continued acquisition activities even though much of the announcement abnormal returns to bidders are negative.

The remainder of this paper proceeds as follows. Section 4.2 lays out the hypotheses tested in this paper. Section 4.3 provides the background material for the hypotheses. Section 4.4 describes the merger data sample. Section 4.5 reports and discusses the empirical results of the event study analysis. Section 4.6 concludes the paper.

4.2 Testable Hypotheses

4.2.1 Collusion Hypothesis

The Telecommunications Act, for the first time, allowed mergers and vertical integrations previously barred under FCC rules, antitrust provisions of federal law, and the "Modified Final Judgment" (the ruling governing the 1984 "break-up" of AT&T), and thus enhanced the plausibility of collusion via mergers. A testable implication of this relaxation of regulation is that evidence of the collusive aspects of telecom mergers should be more apparent in the post-deregulation period following the passage of the Telecommunications Act of 1996. Kim and Singal (1993) and Singal (1996) find evidence of collusion in the airline industry following deregulation.

The collusion hypothesis implies that the announcement of a merger following the 1996 deregulation would lead to expectation of higher product prices and industry profitability. This is because the merger, by effectively reducing the number of competitors, can reduce the cost of monitoring any collusive agreement and increase the incentive to coordinate (Stigler, 1964), and thereby enhance the ability of the remaining firms to exert market power. The drive towards a vertically integrated product package may also enhance market power by increasing the need for competitors to reach interconnection agreements in order to offer packaged services. Because the potential gains from higher product prices would be distributed across the entire set of competitors, the rivals of the merging firms should earn positive abnormal returns on the merger announcement.

4.2.2 Efficiency: Competitive and Anticipation Hypotheses

The above implications of the collusion hypothesis are necessary but not sufficient to conclude that a given merger is anticompetitive (Eckbo, 1983). As Table 4.1a shows, the pattern of returns to the merging firms and their rivals can be consistent with both collusion and efficiency. While the collusion hypothesis restricts the sign of the abnormal returns to the rivals, the efficiency hypothesis does not. With respect to efficiency, Eckbo (1983) notes that a merger announcement can have a product/factor price effect and an offsetting information effect. The price effect, where a merger following deregulation results in a more competitive firm in product/factor markets, would cause a negative change in the market value of the rivals on merger announcement. I term this price effect the competitive hypothesis.

On the other hand, the information effect, where the announcement of a proposed efficient merger of firms with complementary technologies signals potential synergies between rivals and subsequent bidders, would cause a positive change on average in the market value of rivals on merger announcement. The announcement of a merger following deregulation that signals confirmation of the drive towards scale and a vertically integrated product package would be expected to increase the probability that more firms will become targets in subsequent takeovers. According to this anticipation hypothesis, rivals earn positive abnormal returns because of the increased probability that they will become targets themselves (Song and Walkling, 2000). If the market's reaction to the merger announcement conveys merger-specific information, the merger would be expected to be informative about likely future targets. Positive abnormal returns are expected to accrue to those rivals that become subsequent targets.

Table 4.1b presents merger announcement abnormal returns predictions for samples of rivals based on subsequent merger activity. The anticipation hypothesis provides a potential explanation of the cross-sectional dispersion in abnormal returns to rivals. Revisions in a rival's stock price occur because of changes in the perceived probability of acquisition attempts, and these changes vary systematically with individual firm characteristics (Song and Walkling, 2000; Cai, Song and Walkling, 2011).

4.3 Background

Maloney and McCormick (1995) analyze the wealth effects of (i) the November 4, 1992 announcement of the proposed merger between AT&T and McCaw Cellular, and (ii) the January 4, 1994 announcement of plans by MCI to establish a fiber-optic local telephone loop in most major American cities. The wealth effects of these events were such that these long-distance carriers, AT&T and MCI, were expected to benefit from enhanced entry into the local phone market at the expense of the incumbent local exchange carriers (the Baby Bells), who were prohibited by the 1982 "Modified Final Judgment" (MFJ) from entry into the long-distance phone market. Maloney and McCormick (1995) link the wealth effects of these events to a market dictating that companies offer a completely vertically integrated product package in the midst of a growing scope and quality of products and services brought about by innovations in communication technologies.

The Telecommunications Act of 1996, in addition to facilitating entry into the local phone market, allowed the Baby Bells to enter into the long-distance phone market. Essentially, the 1996 deregulation changed the structure of the telecommunications industry. Deregulation, spurred largely by technological changes, transformed the industry from a collection of distinct markets, along product and geographical lines, to an industry where every communications business virtually competes with every other communications business in any market. Technological innovations had already begun to foster competition and blur product and geographical market boundaries prior to deregulation. Policy makers recognized the trends and deregulation basically facilitated the expansion of new communication technologies. For example, innovations related to satellite use of the electromagnetic spectrum spurred more competition within media transmission as a whole, engaging companies that previously specialized in either phones or cable (Weston et al., 2004).

As a result of deregulation, mergers previously restricted by law become a viable alternative to achieving scale and a vertically integrated product package. Not long after deregulation, the President and CEO of WorldCom agreed to acquire MFS Communications in 1996 and commented that "what every company in this industry wants to accomplish is to be able to provide end-to-end service, i.e. from the point of origination to the point of destination, internationally, over a single company's own facilities." He added that the new company, "MFS WorldCom", will be the first company to provide such end-to-end service since the breakup of AT&T, bringing together local calling, long-distance and internet access. The Telecommunications Act, for the first time, allowed mergers and integration of services previously barred under FCC rules, antitrust provisions of federal law, and the "Modified Final Judgment" (the ruling governing the 1984 "break-up" of AT&T). Mergers raise the plausibility of collusion by reducing the number of potential competitors. The move towards a vertically integrated package of services also raises the plausibility of collusion by increasing the need for competitors to reach interconnection agreements in order to offer packaged services, given technical infrastructure constraints in the telecommunications industry. Simple co-operative agreements can contribute to fostering collusion (Buigues and Rey, 2004).

4.3.1 Telecommunications Deregulation

The Telecommunications Act of 1996, approved by congress on January 3, 1996 and signed into law on February 8, 1996 by President Bill Clinton, overhauled the Communications Act of 1934. The goal of the new law is to let anyone enter into any communications business – to let any communications business compete in any market against each other⁵. The 1996 Act was also a response by the U.S. Congress to calls to undo the regional bell operating companies' (RBOCs) monopoly over local telephone service in the midst of new technologies including cable television, cellular (or wireless) service, the internet etc. that offered alternatives to the services provided by the incumbent local telephone companies. The 1996 Act also created a process by which the RBOCs would be free to offer long distance service once the RBOCs made a showing that their local markets had been opened up to competition⁶.

The first major deregulation event that preceded the overhaul of the Communications Act of 1934 was the 1984 break-up of AT&T, following the 1982 Consent Decree settling the government's antitrust case against the former Bell System monopoly, and transforming the

⁵ Retrieved from fcc.gov

⁶ U.S.C. section 271

telephone equipment and services sector from a regulated monopoly into a set of increasingly competitive markets. MCI and Sprint created their own networks, becoming strong competitors for AT&T in the long distance service market. AT&T's risk increased subsequent to the 1984 break-up (Chen and Merville, 1986).

The incumbent local exchange carriers (ILECs), including the regional bell operating companies (RBOCs) spun-off from AT&T, also experienced new forms of competition from competitive local exchange carriers (CLECs) that began to offer private line and special access services in competition with the ILECs beginning in 1985. A number of state public utilities commissions, particularly New York, Illinois, and Massachusetts, encouraged this competition, with CLECs such as Teleport Communications Group (TCG) and Metropolitan Fiber Systems (MFS) deploying fiber optic systems. Between 1992 and 1993, the Federal Communications Commission (FCC) made several regulatory decisions to facilitate competitive entry or the expansion of new technologies (e.g. personal communications services) in the local communications market. These decisions were associated with a significant decline in the aggregate value of the RBOCs (Green and Lehn, 1995). By the mid-1990s most of the large states had authorized local exchange competition.

The Telecommunications Act of 1996 incorporated the results of the state-by-state authorization process by creating a uniform national law to allow local exchange competition. The original CLECs spent the decade from 1985 to 1995 deploying their own fiber optics networks and digital switches, effectively reducing their reliance on the ILECs. In contrast, many CLECs formed after the 1996 Act operated with greater dependency on the ILECs. MFS and TCG, the largest facilities-based CLECs had IPOs in 1993 and 1996, respectively, and then were acquired by WorldCom and AT&T, respectively in 1996 and 1998, as these long distance companies prepared to defend their business customers from the regional bell operating companies (RBOCs) entry into the long distance market. Mergers and integration of services previously barred under FCC rules,

antitrust provisions of federal law, and the "Modified Final Judgment" (the ruling governing the 1984 "break-up" of AT&T) are allowed for the first time by the 1996 Act.

4.3.2 Regulatory Concerns over the Collusive Effects of Telecom Mergers following Deregulation

The Telecommunications Act of 1996 left intact the FCC's authority to review communications industry mergers. The ABA section of the Antitrust Law, Telecom Antitrust Handbook (2005) describes the FCC's merger review approach, which starts from roughly the same point as the Department of Justice (DOJ) and the Federal Trade Commission (FTC) by defining the relevant product and geographical market under the precepts outlined in the 1992 Merger Guidelines. The FCC then identifies the competitors who participate in the relevant market, and this is where the FCC's analysis begins to diverge from that of the antitrust agencies (the DOJ and FTC). In addition to identifying actual competitors in the relevant market, the FCC analyzes the "precluded competitors", which are firms that are most likely to enter but were prevented or deterred from market participation by barriers to entry, until the passage of the Telecommunications Act.

The FCC takes precluded competitors into account because it views many telecommunications markets as "transitional markets," i.e. markets in the process of transformation from regulated monopolies to competitive markets with lower entry barriers produced by the 1996 Act. The FCC assesses whether a merger might eliminate potential future competition from firms not yet participating in a relevant market. The FCC then assesses the merger's likely effects on competition by considering whether the merger will enhance the merged firm's unilateral power to raise price or reduce output, or facilitate coordination among firms remaining in the markets. The FCC also considers whether entry by new competitors or expansion by existing competitors would be "likely, prompt, and effective" enough to counteract the price-raising and quantity-lowering incentives that may result from the proposed merger. In addition, the FCC assesses the effect of the

merger on concentration and any "public interest benefits" – both efficiencies and pro-competitive conditions placed on the merger to offset any anticompetitive effects it may have.

The case study (ABA section of the Antitrust Law, Telecom Antitrust Handbook, 2005) of the FCC's review of the 1997 merger (announced in 1996) of Bell Atlantic and NYNEX provides a good illustration of the concerns of regulators regarding the collusive effects of telecom mergers. Bell Atlantic, an RBOC, was the ILEC in the Mid-Atlantic, West Virginia, and Washington, D.C. NYNEX, also an RBOC, was the ILEC in New York and most of New England. Both provided inter-local calling area service between their respective adjacent LEC regions, and they were general partners in a wireless telephony firm, Bell Atlantic NYNEX Mobile. The DOJ cleared the merger without conditions. However, the FCC found significant impacts on competition and imposed conditions before clearing the merger. The FCC first defined three relevant product markets: (1) local exchange and exchange access service, (2) long-distance service, and (3) local exchange and exchange access service bundled with long-distance service.

Applying its transitional market and precluded competitor methodologies, the FCC determined that there were five "most significant market participants" in the markets it had defined: NYNEX, Bell Atlantic, AT&T, MCI, and Sprint. The FCC then determined that by eliminating Bell Atlantic as a potential entrant into the New York area and the most likely "second choice" for current NYNEX customers, the merger would facilitate the exercise of unilateral power in the market for "mass market local services" by the merged entity. The FCC next concluded that the merger would facilitate discrimination in the provision of local loop services to competing long-distance carriers, thus creating a risk of unilateral effects in the market for "mass market bundled services." The FCC also found that the merger would enhance risk of coordinated pricing, particularly in the market for bundled local and long-distance services and that entry would be

unlikely. The FCC imposed significant conditions on the merger based on its determination that the merger posed risks to competition, not recognized by the DOJ and the FTC.

4.3.3 The Plausibility of Collusion in Telecom Mergers following Deregulation

The concerns that regulators have about telecom mergers, market power and collusion is exemplified by the FCC's review of the 1997 (announced in 1996) merger of Bell Atlantic and NYNEX. Other notable mergers following the 1996 deregulation include the acquisition of two RBOCs, Pacific Telesis Group in 1996 and Ameritech in 1998 by SBC Communications Inc. – another RBOC. Qwest acquired US West in 1999, and MCI Communications Corp was acquired by WorldCom in 1998. AT&T acquired Teleport Communications Group (TCG) in 1998.

The telecommunications industry is a new industry post-deregulation to the extent that it takes on a completely different competitive structure. Deregulation not only affected the level of entry or competition in the telecommunications industry but also the nature of competition – who and where the competition is. In the post-deregulation era the competition becomes less defined along product and geographical boundaries but more in global terms as companies pursued scale and a vertically integrated product package, in line with consumer demands. The 1996 Act brought an end to previous boundaries set by federal and state laws. This is underscored by the comment by the Chairman and CEO of SBC Communications Inc. shortly after the passage of the Act: "all of us at SBC and Southwestern Bell welcome the opportunity to focus completely on our customers and what they want and need, and not just what products we are allowed to sell by law."

The appeal of the Chairman and CEO of Pacific Telesis to California regulators to give the green light to its merger with SBC in 1996 represents a view point that these mergers were competitive imperatives. He noted that "those suggesting that Pacific Bell can continue to be a major player in today's global markets are in a sever state of denial." Adding that "if Pacific Bell is going to be successful in the future, it must have the resources to stand up to the major competitors (e.g., AT&T and MCI) it will face."

The move towards a vertically integrated product package raises the plausibility of collusion by increasing the need for competitors to reach interconnection agreements in order to offer packaged services, given technical infrastructure constraints in the telecommunications industry. Simple co-operative agreements can contribute to fostering collusion (Buigues and Rey, 2004). First, mutual interconnection among competitors enables interaction and creates more scope for collusion. Second, incumbents may collude in the terms they propose to new entrants in order to protect their incumbency advantages. Third, and perhaps more importantly, interconnection agreements have a direct impact on the operators perceived costs, and thus exert a direct influence on their pricing decisions, as well as on their decisions concerning new capacity investments, technological choices etc. Also, operators can design the agreements so as to soften competition.

However, there is little scope for collusion in the absence of entry barriers and in innovation-driven markets. The broad intent of the 1996 Act is to allow every communication business to compete with any other in any market using any communication technology infrastructure. It opened both markets for local and long distance phone services to competition from new communication technologies that was already underway well before the draft of the 1996 Act. Deregulation facilitated entry, via initial public offerings (IPOs), and the expansion of new technologies including fiber optic, cellular, cable and internet. Collusion is more difficult when there are more competitors and rapid technological innovations. Technological innovations can allow one firm to gain a significant advantage over rivals. But in the absence of any innovative activity, incumbents would benefit from promoting a secure and stable environment, and would hesitate before cheating on a collusive conduct that might trigger a price war and reduce future rents.

4.4 Data Sample

To construct the data sample, I begin with the universe of firms listed on the CRSP monthly stock file, which consists of publicly traded firms on the NYSE, AMEX and Nasdaq stock exchanges. The sample period is from 1979 to 2009, which spans the 1984 and 1996 deregulation events. I restrict the sample to firms belonging to the Standard Industry Classification (SIC) codes 4810 to 4813, which pertain to the telephone communications (telecom) sector of the broader communication industry. I identify firms with CRSP Share Code 10 and 11, and thus exclude foreign firms (incorporated outside the U.S. and ADRs). This leaves us with a sample consisting only of domestic public U.S. telecom firms. I track every firm using its unique CRSP identifier, PERMNO, each year over the sample period from the time it enters the sample to the time it exits. See Table 4.2 for summary of sampling procedure.

Table 4.3 presents the time-series distribution of the sample of U.S. publicly traded telecom firms. There are 26 U.S. telecom firms listed on CRSP as at the beginning of 1979 and a total of 278 new firms attain CRSP listing status over the 1979 to 2009 sample period. These combine for a total of 2,186 firm-year observations based on the number of firms listed at the end of each year during the sample period, implying an average of about 70 firms per year. The number of publicly traded U.S. telecoms increases from 26, at the beginning of 1979, to 52 at the end of 1984, after the breakup of AT&T. It then rises to 90 at the end of 1995, prior to the January 3, 1996 passage by Congress of the Telecommunications Act. After deregulation it reaches a high of 122 firms at the end of 2000, and then rapidly declines to 76 at the end of 2002, following the 2001 recession. The industry consolidates further to 45 publicly traded firms at the end of 2009.

4.4.1 Merger Sample

From the 258 telecom firms that exit the public markets, matching up with data from the CRSP delist file over the 1979 to 2009 sample period, I identify 138 exits via mergers based on data from SDC's mergers and acquisitions (M&A) database and information from news wires on LexisNexis, which aided in determining 44 of the merger exits. The All Merger column of Table 4.3 reports the distribution of merger activity in the telecommunications industry over the sample period. Of the 138 merger deals, where the targets are publicly traded U.S. telecoms, 99 deals involve public bidders with CRSP return data, 16 deals involve private bidders and 15 deals involve foreign bidders. 44 (32%) of the 138 merger deals involve payments made with 100% cash. A quick examination of the annual trend of merger activity reveals a cluster of merger activity between 1996 and 2000, following the passage of the 1996 Telecommunications Act.

Figure 4.1 presents the annual time-series plot of telecom merger activity based on the market equity values of the targets in the mergers. The data supports the notion that the period following telecom deregulation is a more frequent bidding environment – a "mergers possible state." After a relatively dormant period, merger activity rises in 1996 and stays at a relatively high level through 2000, which is followed by another relatively dormant period that lasts through 2003. Merger activity in the telecom industry picks up again in 2004. The data therefore suggests that after deregulation merger activity clusters during two independent time periods, i.e. from 1996 to 2000 and from 2004 to 2007. These time periods of frequent bidding activity, following periods of relative inactivity, provide a good setting for tests of the anticipation hypothesis. It is reasonable to assume that a portion of the mergers that occurred during these time periods are anticipated, with the initial bid being less anticipated than the average bid.

4.5 Empirical Results

4.5.1 Abnormal Returns to the Merging Firms

I report in Table 4.4 the average merger announcement abnormal returns for targets and bidders for the 3-day event window (-1, +1), where day 0 is the merger announcement date. The merger announcement date is determined first using data from Security Data Corporation's (SDC) Mergers and Acquisitions database, and then confirmed or updated with information from news wires on LexisNexis. I estimate net-of-market returns using the CRSP value-weighted index as the market proxy. The results are robust to using the CRSP equally-weighted index or to using an alternative estimation method such as a market model with a 200-day estimation period (-210, -11). I also report combined firm returns, weighted average returns, defined as the sum of the target's return multiplied by its pre-merger equity value, plus the bidder's return multiplied by its pre-merger equity value. The equity values are scaled by the sum of the target and bidder's pre-merger values.

Table 4.4 reports the merger announcement abnormal (net-of-market) returns for various sample periods. Variations in the number of observations are due to the fact that the full sample, 138 mergers, includes non-public bidders or bidders without CRSP return data. Combined firm returns are computed for mergers where both the target and the bidder are publicly traded or CRSP listed firms (99 mergers). For the full sample, the mean target abnormal return is 14.90%, mean bidder abnormal return is -2.16%, and mean combined abnormal return is 1.63%. These returns are significantly different from zero. For the pre-deregulation period (1980 – 1995), the mean target abnormal return is 0.70%. The bidder and combined returns are statistically insignificant. In contrast, for the post-deregulation period (1996 – 2009), the mean bidder and combined abnormal returns (-2.64%)

and 2.22%, respectively) are significant. I obtain a similar pattern of abnormal returns for the short 5-year pre-deregulation and post-deregulation periods.

To summarize, the abnormal returns to targets are significantly positive across all sample periods. The abnormal returns to bidders are not significantly different from zero in the prederegulation period, but significantly negative in the post-deregulation period. The decline in wealth for bidders in the post-deregulation period could be the result of empire building or hubris (Roll, 1986) on the part of bidding managers as mergers are enabled by the telecommunications deregulation – the industry becomes a more frequent bidding environment or a "mergers possible state" following deregulation. But the empire building and hubris hypotheses, in the absence of synergies, would predict non-positive abnormal returns for the combined firm.

Alternatively, the negative abnormal returns to bidders in the post-deregulation period could be the result of a more competitive environment where firms are willing to bid up the price of potential synergies. Cai, Song and Walkling (2011) find that abnormal returns of firms bidding on public targets is on average negative and more negative for anticipated bids, i.e. bids occurring in a more frequent bidding environment. Bradley, Desai, and Kim (1988) and Eckbo and Betton (2000) note that competition lowers bidder returns. Abnormal returns to the combined firms are significantly positive in the post-deregulation period. The positive wealth effect for the combined merging firms is consistent with the collusion hypothesis as well as the two efficiency hypotheses treated in this paper – the competitive and anticipation hypotheses. In the following sub-sections, I discuss the tests to distinguish between these alternative hypotheses.

4.5.2 Abnormal Returns to Rivals of the Merging Firms

To test the collusion and efficiency explanations of the positive abnormal returns to the combined merging firms, I follow the Eckbo-Stillman approach of analyzing the announcement returns to the rivals of the merging firms. This approach basically uses the announcement returns to rivals of merging firms to make inferences about the possible motives of the mergers. The collusion hypothesis predicts positive abnormal returns for rivals of the merging firms where the expected effect of collusion via mergers is higher product prices and industry profitability. The competitive hypothesis predicts negative abnormal returns to rivals where the expected effect of the telecom mergers is that the merging firms become more competitive in product and factor markets. The anticipation hypothesis predicts positive abnormal returns to rivals where the information signaling effect of the telecom mergers is an increased probability that rivals will be targets themselves in future takeovers, i.e. increased opportunities to more efficiently deploy resources of rivals.

Table 4.5 reports the abnormal returns to rivals of the merging firms the full, the prederegulation and the post-deregulation sample periods, and for samples based on the rivals subsequent merger activity within one year of each merger announcement. For each merger, the portfolio of rivals consists of all U.S. telecom firms belonging to SIC codes 4810 to 4813 and CRSP Share codes 10 and 11 (this excludes foreign firms), and that are in existence as at the time of a given merger announcement. For each merger, I exclude rivals that happen to be targets or bidders in another merger deal announced within the 3-day window of the merger deal in focus. This rather broad scope of relevant rivals or competitors, although it may be less suitable for the prederegulation era, is arguably suitable for the post-deregulation era because the competition becomes less defined along product and geographical boundaries but more in global terms as companies moved towards scale and a vertically integrated product package of complementary technologies.

The analysis comprises the full sample of 138 merger observations, with every target being a publicly traded firm with CRSP return data, and 11,768 rival observations. For each merger, using the net-of-market returns, I compute the average return to the portfolio of rivals for the 3-day window (-1, +1) centered on the merger announcement date. For the full sample period (Panel A),

the mean abnormal return to rivals of merging firms is positive (0.45%) and significant with about half (49%) of the rivals experiencing positive abnormal returns on merger announcement. Similar to the findings in Song and Walking (2000), the result shows that while the mean abnormal return to rivals is positive and significant, the distribution of returns is dispersed and symmetric around zero. Panel B shows similar evidence of positive abnormal returns to rivals with substantial cross-sectional dispersion for both the pre-deregulation and the post-deregulation periods.

The positive mean abnormal return to rivals is consistent with the hypothesis that the mergers are motivated by collusion and should lead to higher product prices and industry profitability – the collusion hypothesis. But the collusion hypothesis offers little help in explaining the cross-sectional dispersion in the abnormal returns to rivals. A comparison of the results for the pre-deregulation and post-deregulation samples suggests that, if the positive abnormal returns to rivals are indicative of the collusive effects of telecom mergers, then any collusive effects of telecom mergers do not increase in the post-deregulation era.

The positive mean abnormal return to rivals is not consistent with the competitive hypothesis that merging firms gain a competitive advantage over their rivals. However, given the substantial cross-sectional dispersion in the abnormal returns to rivals, the possibility that some telecom mergers result in a more competitive merged entity is not ruled out by the data. Another possible test is to examine whether the proportion of rivals with positive abnormal returns is (i) equal across all merger observations and (ii) equal to 50% in all merger observations.

The positive mean abnormal return to rivals is consistent with the hypothesis that the mergers signal potential synergies between rivals and subsequent bidders or an increased probability that rivals will become targets themselves. This anticipation hypothesis is a possible reason for why the market values of rivals of merging firms are affected differently by merger announcement. As

Song and Walkling (2000) note that, in the case of changing technology, firms exhibit different adoption rates/costs, different degrees of information about new processes, or different attitudes towards risk of new processes. Therefore, merger-specific information that causes a shift in the mean and/or variance of the distribution of potential or actual gains from future mergers to vary across rival firms could lead to cross-sectional variation in abnormal returns to rivals.

I test the anticipation hypothesis by further sectioning the sample of rival firms based on their subsequent merger activity within one year of each merger announcement and report the results in Panel C of Table 4.5. Obviously, investors' information about which rivals will become subsequent targets and bidders is uncertain as at the time of merger announcement, and so the use of ex post data on actual subsequent merger activity only serves as a proxy for such information. For the full sample period (1980 – 2009), rivals of merging firms that become subsequent targets within one year of merger announcement earn a statistically significant mean abnormal return of 0.92%. Rivals that become subsequent bidders within one year of merger announcement earn a statistically significant (at the 10% level) mean abnormal return of 0.42%, similar to the mean abnormal return earned by rivals who do not become subsequent targets or bidders within one year of merger announcement.

I analyze the pre-deregulation and post-deregulation samples of the data since the degree of surprise or the price-adjusting effect of anticipation of subsequent acquisition attempts is likely to vary over time with the level of merger activity. Song and Walking (2000) find that the abnormal return to rivals tends to increase with the magnitude of surprise about an acquisition. On average, the degree of surprise about acquisitions is expected to be greater in the pre-deregulation period than in the post-deregulation period because telecommunications deregulation enabled mergers. Also, because the industry becomes a more frequent bidding environment after deregulation, the

degree of surprise about acquisitions is expected to be greater for the initial merger announcement than for subsequent merger announcements following deregulation.

The results in Panel C of Table 4.5 shows that, for the pre-deregulation period (1980 – 1990), the mean abnormal return to rivals who become subsequent targets within one year of merger announcement is significantly higher than the mean abnormal return to rivals who do not become subsequent targets or bidders. But for the post-deregulation period (1996 – 2009), the mean abnormal return to rivals who become subsequent targets within one year of merger announcement is not significantly higher than the mean abnormal return to rivals who do not become subsequent targets or bidders. This is consistent with the idea that there is a lesser degree of surprise on average about acquisitions in the post-deregulation period. For both periods, the mean abnormal return to rivals who become subsequent bidders within one year of merger announcement is non-negative and not significantly different from zero. For more evidence on the role of anticipation, I examine the return patterns associated with the initial merger announcement following deregulation.

5.3. Initial Merger Announcement Following Deregulation

The initial merger announcement following the passage of Telecommunications Act of 1996 is the \$16.7 billion proposed acquisition of Pacific Telesis Group by SBC Communications Inc. (the first merger of two Baby Bells from among the even formed from the 1984 break-up of AT&T) on April 1, 1996. The merger would create the second largest U.S. phone company behind AT&T Corp and give the combined firm the largest share of the local phone market in California and Texas. Regarding a possible motive behind this initial transaction, a news report from the Associated Press on the day of the merger announcement notes that "it [the merger] gives SBC and Pacific Telesis greater size and power to offer a broader range of communications services, something made possible by the law." The news report adds that "although local Bell phone companies were not previously prohibited from combining, the new telecommunications law created a competitive environment that has made it more expedient for them to merge."

Although caution must be applied in extrapolating a merger motive from this very limited sample of news report, this story corroborates other evidence from previous research (e.g. Maloney and McCormick, 1995; Hazlett, 1999) that suggest an industry trend towards scale and a vertically integrated product package. Deregulation can be said to have had the effect of accelerating this industry trend. For instance, the growth of cellular phone technology in the early 1990s was accompanied by consolidation and acquisitions in the cellular space prior to the draft of the Telecommunications Act. Here are a few examples: AT&T acquired McCaw Cellular in 1993; GTE Corp acquired Contel Cellular Inc. in 1994; Bell Atlantic and Nynex announced the merger of their cellular operations into a new \$13 billion company, Bell Atlantic Nynex Mobile, in 1994. Consolidation in the cellular space was then spurred faster by deregulation. For example, on April 6, 1996, Airtouch Communications Inc. announced its proposed acquisition of the 60% of Cellular Communications Inc. it did not already own for \$1.65 billion.

It could be argued that the merger between SBC and Pacific Telesis was motivated by potential efficiency benefits from economies of scale, complementary technologies, common branding of a broad range of communications services etc. in a more competitive environment. It could also be argued that the merger was motivated by collusion. The merger may increase coordination in pricing in markets for bundled services by virtue of the fact that it effectively eliminated a competitor. In the former case, the merger announcement potentially signals an increased probability of mergers and information about subsequent mergers, amidst opportunities for potential synergies between rivals and subsequent bidders. This is the anticipation hypothesis. On the announcement of this initial merger following deregulation, the abnormal return (-1, +1) to the target is 21.64%, abnormal return (-1, +1) to the bidder is -6.97% and the abnormal return (-1, +1) to the combined firm is 2.83% (Table 4.6, Panel A). There is not much evidence of stock price run-up prior to the announcement. Notwithstanding the positive abnormal return to the combined firm, the negative abnormal return to the bidder suggests that hubris could be a positive motive. The mean abnormal returns (-1, +1) to rivals is positive (1.23%) and significant, with about 55% of the 93 rival firms earning positive abnormal returns. The other five remaining Baby Bells all experience positive abnormal returns ranging from 1.66% for Bell Atlantic Corp (a subsequent bidder) to 2.50% for Nynex Corp (a subsequent target). The positive mean abnormal return to rivals supports both the collusion and anticipation hypotheses. But it does not support the hypothesis that the merging firms will be replaced by a new entity more competitive than rivals.

This initial merger potentially enhances the ability of the remaining firms to raise product prices by effectively eliminating a competitor and creating the second largest U.S. phone company. On the other hand, the initial merger is a potential signal that rivals (including the other Baby Bells) will become acquisition targets amidst opportunities for potential synergies following deregulation. The positive abnormal returns experienced by rivals do not lend support to the possibility that the merger is motivated by hubris on the part of SBC's management, unless perhaps the merger results in a new combined firm that will be less competitive than rivals. If the cross-sectional pattern of abnormal returns to rivals is reflective of anticipation of subsequent acquisition attempts, then there should be less support for the collusion hypothesis, as well as the hubris hypothesis.

I use ex post data on rivals subsequent merger activity within one year of the initial merger announcement as a proxy for investors' merger-specific information revealed by the merger announcement about subsequent acquisition attempts. The mean abnormal return to rivals who become subsequent targets is a significant 4.02%, with 6 out of 7 (86%) of these rivals experiencing

positive abnormal returns. The result of the difference in means tests presented in Panel C of Table 4.6 shows that the mean abnormal return to rivals who become subsequent targets within one year of the initial merger announcement is significantly larger than the mean abnormal return to rivals who do not become subsequent targets or bidders within one year of the merger announcement. Rivals who become subsequent targets also earn significantly larger returns than rivals who become subsequent bidders. The mean abnormal return to rivals who become subsequent bidders is not significantly different from the mean abnormal return to rivals who do not become subsequent targets or bidders.

Consistent with the anticipation hypothesis, the evidence suggests that the initial merger announcement reveals information about subsequent acquisition attempts that accounts for a portion of the cross-sectional variation in the abnormal returns to rivals. The positive price adjustments to rivals who become subsequent targets, as predicted by the anticipation hypothesis, is consistent with the informational effect of a proposed efficient merger of firms with complementary technologies – a signal of potential synergies between rivals and subsequent bidders. This evidence regarding the initial merger announcement does not support the notion that telecom mergers following deregulation were motivated by collusion. In order draw addition inferences on the possible motives behind the telecom mergers, I perform similar analysis for the second and third merger announcements following deregulation.

4.5.4 Second and Third Merger Announcements Following Deregulation

Four merger announcements occur within a month of the initial merger announcement. The makes for a total of 5 telecom mergers within a space of one month of the initial merger announcement following deregulation. The initial merger announcement occurred about 3 months after the passage of the Telecommunications Act of 1996. I analyze the abnormal returns to the

second and third merger announcements for further evidence that may or may not support the influence of anticipation in merger announcement abnormal returns following deregulation.

The second merger announcement is the acquisition of Cellular Communications Inc. by AirTouch Communications Inc. on April 6, 1996. Table 4.7a shows that the announcement abnormal return is positive for the target and negative for the bidder. This deal, which happens to be a continuation of consolidation in the cellular space that began prior to deregulation, occurs only a few days after the initial merger announcement following deregulation and may not have had as much of a degree of surprise as the initial merger announcement. But it may have provided incremental confirmation of an increased probability of more telecom mergers.

The mean abnormal return to rivals is a positive and significant (1.34%), with about 56% of rivals experiencing positive abnormal returns. Of the 93 rivals, 6 (5) become subsequent targets (bidders) within one year of the merger announcement. The mean abnormal return to the rivals who become subsequent targets is significantly larger than the mean abnormal return to rivals who become subsequent bidders, and also larger (not significantly) than the mean abnormal return to rivals who rivals who do not become subsequent targets or bidders within one year of the merger announcement.

With respect to the third merger announcement, the evidence suggests a lesser degree of surprise. The acquisition of Nynex Corp by Bell Atlantic Corp was announced on April 22, 1996, about 20 days after the initial merger announcement following deregulation. This merger of two Baby Bells of roughly equal size would create what would then be the second largest U.S. telephone company after AT&T. Regarding this pure exchange of shares deal, a New York Times article dated April 21, 1996 states that "in the negotiations Bell Atlantic was insisting that Nynex shares should be valued at lower than the recent market price, since the shares had strongly increased in a market

speculating on the merger." This reference to a run-up in the price of the target must have been in relation to the price performance of the bidder as suggested by the data. There is a reversal of fortunes for the target (-7.91%) and bidder (4.54%) on the announcement (see Table 4.7b).

The gains enjoyed by both Nynex (2.50%) and Bell Atlantic (1.66%) on the announcement of the initial merger following deregulation, as noted earlier, support both the collusion and anticipation arguments. But less support is offered to the collusion argument by the negative abnormal return to the combined Nynex/Bell Atlantic on their merger announcement. In contrast, on the announcement of the Nynex/Bell Atlantic merger, other 4 remaining Baby Bells all post gains, ranging from 0.33% for SBC Communications Inc. to 3.11% for BellSouth Corp. In addition, I examine the other 3 "most significant market participants" or rivals (as identified by the FCC) in the "relevant product and geographical market" (as defined by the FCC) and find that only Sprint Corp posted a gain. AT&T Corp and MCI Communications Corp both earned negative abnormal returns. These announcement return patterns do not support the FCC's view that the Nynex/Bell Atlantic merger would facilitate the exercise of unilateral power by the merged entity and enhance risk of coordinated pricing. The patterns support anticipation of potential synergies between the remaining Baby Bells and subsequent bidders.

The mean abnormal return to all rivals on the announcement of the merger is an insignificant 0.34%. The mean abnormal return to the 4 (3) rivals firms who become subsequent targets (bidders) is 1.94% (-2.04%) but insignificant (significant). Although all 4 rivals who become subsequent targets were gainers on the previous (second) merger announcement, only 2 of 4 become gainers on this merger announcement. UUNET Technologies Inc., which was the fastest-growing internet service provider in the mid 1990s and was subsequently acquired on April 30, 1996, was the major earner of a substantial 10.82% on this merger announcement. UUNET Technologies Inc. Had also earned 14.92% and 7.68% on the second and initial merger announcements, respectively. The

large abnormal return of 33.74% to UUNET on its acquisition announcement by MFS Communications Inc. (a fiber-optic competitive local exchange carrier) obviously does not reflect the previous anticipation driven price-adjustments. MFS Communications Inc. was then acquired by WorldCom Inc. on August 26, 1996.

Taken together, the evidence from the initial as well as the second and third merger announcements suggests that (1) bid announcements signal information about subsequent bidders, targets and the industry, (2) a substantial amount of the bidding activity that occurred following deregulation in the telecommunications industry is anticipated by the market. If the market anticipates a bid announcement, actual announcement returns will not fully capture the wealth effects of the bid (Cai, Song and Walkling, 2011). Anticipation, amidst potential synergies and an industry trend towards scale and a vertically integrated product package in a more competitive postderegulation environment, helps explain why bidders continued acquisition activities even though much of the announcement abnormal returns to bidders are negative. The markets response to the announcement of the Nynex/Bell Atlantic merger, which was challenged by the FCC, shows little evidence indicating that the merger would have had collusive or anticompetitive effects.

4.6 Conclusion

The clustering of merger activity at the industry-level has been linked to economic shocks from deregulation and technological changes (Mitchell and Mulherin, 1996; Harford 2005). Evidence of this clustering phenomenon is clearly found in the telecommunications industry following the passage of the Telecommunications Act of 1996. The merger literature suggests a number of alternative theories on the motives behind such frequent bidding activity that occurred in a more competitive post-deregulation environment. These theories include collusion, efficiency and hubris (Roll, 1986). Efficiency theories cover a wide range of possible explanations for merger, including the competitive (product/factor price effect of merger) hypothesis and the anticipation (information effect of merger) hypothesis treated in this paper.

In this paper, I examine these alternative theories by studying the announcement abnormal returns to rivals of merging firms, including the Nynex/Bell Atlantic merger challenged by the FCC on collusion concerns, using an approach pioneered by Eckbo (1983) and Stillman (1983). I find strong support for anticipation and the signaling of merger-specific information through bidding activity. 1) The market appears to be able to extract merger-specific information from bid announcements to distinguish between subsequent targets/bidders and subsequent non-targets/non-bidders but does not appear to be able to predict the first target/bidder. 2) A substantial amount of the bidding activity that occurred following deregulation in the telecommunications industry is anticipated by the market. The markets response to the announcement of the Nynex/Bell Atlantic shows little evidence that the merger would have had collusive or anticompetitive effects.
Table 4.1a: Predictions for Abnormal Returns to Merging Firms and Rivals

 As predicted by the contaston and efficiency:
 Merging Firms
 Rivals

 Hypothesis
 Positive
 Positive

 Efficiency:
 Competitive Hypothesis
 Positive

 Anticipation Hypothesis
 Unrestricted
 Positive

This table presents the sign of merger announcement abnormal returns to the combined merging firms and their rivals, as predicted by the collusion and efficiency hypotheses.

Table 4.1b: Predictions for Abnormal Returns to Rivals, given Subsequent Merger Activity

This table presents the signs of merger announcement abnormal returns for samples of rivals, given their participation in subsequent takeover activity, as predicted by the collusion and anticipation hypotheses.

	Rivals Subsequent Merger Activity					
Hypothesis	Target	Bidder				
Collusion	No Prediction	No Prediction				
Efficiency:						
Competitive Hypothesis	No Prediction	No Prediction				
Anticipation Hypothesis	Positive	Negative/Zero				

Table 4.2: Sampling Procedure and Data

This table sketches out the sampling procedure used in arriving at the data sample. I begin with the universe of CRSP listed firms and end up with a sample of unique U.S. public telecom firms for the sample period.

Panel A: Sampling Procedure

- g. Publicly traded firms listed on CRSP (NYSE, AMEX and Nasdaq) for the period 1979 to 2009
- h. Firms belonging to the three-digit SIC code 481 telephone communications segment of telecommunications
- i. Firms with CRSP Share Codes 10 and 11, which excludes foreign incorporated firms and ADRs etc.
- j. Every firm's unique PERMNO is tracked each year from the first to the last time it appears on CRSP
- k. Firms with dual class shares are identified using the CRSP Share Class and adjusted for
- 1. Firms that enter and exit CRSP listing in the same year are excluded

Panel B: Sample

g.	Initial in 1979:	26
h.	Final in 2009:	45
i.	Total unique firms:	304
j.	Firm-year observations:	2, 186
k.	Entries	278
l.	Exits	258

Table 4.3: Annual Time-Series of Telecoms and Merger Activity

This table reports the time-series distribution of the sample of U.S. public telecom firms, identified from CRSP at the end of each year of the 1980 to 2009 sample period, and the number of mergers by year of announcement. These firms belong to the three-digit SIC code 481, which identifies firms in the telephone communications segment of the telecommunications industry. The sample comprises domestic firms, excluding foreign incorporated firms and ADRs. The table also reports the sub-samples of telecom mergers where the bidder is a public firm with CRSP data, a private firm, or a foreign firm. The last column reports the number of mergers involving 100% cash payment.

Year	All Telecoms	All Merger	CRSP listed Bidder	Private Bidder	Foreign Bidder	All Cash Merger
1980	27	3	3	0	0	0
1981	32	1	1	0	0	0
1982	32	0	0	0	0	0
1983	40	1	0	1	0	0
1984	52	1	1	0	0	0
1985	53	1	0	1	0	1
1986	59	3	2	0	0	2
1987	64	2	1	0	0	2
1988	69	2	2	0	0	1
1989	72	1	1	0	0	0
1990	70	5	4	0	1	3
1991	73	4	2	0	0	0
1992	72	3	2	1	0	0
1993	81	3	3	0	1	0
1994	90	8	7	0	0	3
1995	90	4	4	0	0	2
1996	109	8	8	0	0	0
1997	107	10	8	0	0	2
1998	107	11	8	1	1	2
1999	116	15	11	0	4	3
2000	122	10	7	1	3	0
2001	92	4	2	1	0	1
2002	76	1	0	1	0	1
2003	76	2	0	1	0	0
2004	76	4	3	0	0	1
2005	78	9	7	0	0	4
2006	63	7	3	4	1	5
2007	62	8	3	3	3	7
2008	56	2	2	0	0	1
2009	45	5	4	1	1	3
Sum	2,161	138	99	16	15	44
Average	72	5	3	1	1	1



Figure 4.1: Annual Time-series of Merger Activity (by target market equity value)

This figure presents the annual time-series plot of the market equity value of the target firms in mergers.

Table 4.4: Abnormal Returns to the Merging Telecom Firms

This table reports merger announcement abnormal returns to target, bidder, and combined firms for various samples of telecom mergers. The abnormal returns are computed as net-of-market returns for the 3-day event window (-1, +1); the CRSP value-weighted index is the market proxy and day 0 is the merger announcement date. Returns are reported for the full sample period from 1980 to 2009 as well as for the pre-deregulation and post-deregulation sub-periods.

	Mean	(<i>t</i> -stat)	Median	Max	Min	Std Dev	Merger obs
Full Sample, 1980 - 2009							
Targets*	14.90%	8.46	13.64%	119.71%	-39.61%	20.69%	138
Targets	16.46%	8.13	14.46%	119.71%	-29.63%	20.15%	99
Bidders	-2.16%	-2.84	-0.92%	32.19%	-23.86%	7.58%	99
Combined	1.63%	2.10	0.49%	32.19%	-20.75%	7.74%	99
Pre-deregulation Sample, 1980	- 1995						
Targets*	12.15%	3.52	14.73%	72.98%	-39.61%	22.37%	42
Targets	15.23%	3.95	14.45%	72.98%	-29.63%	22.14%	33
Bidders	-1.11%	-0.89	-0.92%	32.19%	-11.81%	7.14%	33
Combined	0.70%	0.54	-0.13%	32.19%	-12.64%	7.43%	33
Post-deregulation Sample, 1990	5 - 2009						
Targets*	16.11%	7.97	12.24%	119.71%	-23.56%	19.79%	96
Targets	16.62%	7.02	14.77%	119.71%	-10.10%	19.23%	66
Bidders	-2.64%	-2.73	-0.99%	13.52%	-23.86%	7.84%	66
Combined	2.22%	2.28	0.97%	28.92%	-20.75%	7.90%	66
Pre-deregulation (5-yr) Sample,	1991 - 1995						
Targets*	16.03%	4.18	14.46%	49.15%	-22.48%	17.97%	22
Targets	17.78%	4.23	14.73%	49.15%	-22.48%	17.84%	18
Bidders	-1.33%	-0.62	-3.61%	32.19%	-9.63%	9.09%	18
Combined	1.30%	0.59	-1.46%	32.19%	-12.64%	9.45%	18
Post-deregulation (5-yr) Sample	e, 1996 - 2000						
Targets*	14.15%	6.92	14.06%	46.43%	-23.56%	15.03%	54
Targets	16.31%	7.06	16.70%	46.43%	-10.10%	14.96%	42
Bidders	-3.68%	-2.57	-1.79%	13.52%	-23.86%	9.27%	42
Combined	2.52%	1.74	0.79%	28.92%	-20.75%	9.42%	42

*Computations based on merger observations where bidder is either public or non-public. All other computations are based on merger observations where bidder is public and CRSP data is available.

Table 4.5: Abnormal Returns to Rival of the Merging Firms

This table reports abnormal returns to rivals for various samples of telecom mergers. The abnormal returns are computed as net-of-market returns for a 3-day event window (-1, +1); the CRSP value-weighted index is the market proxy and day 0 is the merger announcement date. Rivals of the merging firms are all publicly traded U.S. telecom firms (SIC codes 4810 to 4813; CRSP Share codes 10 and 11) at the time of the merger announcement and that are neither the target nor bidder in the deal. For an announced merger deal in focus, I exclude from the observations used in the return computations rivals that happen to be targets or bidders in another merger deal announced within the 3-day window of the deal in focus. Panel A reports abnormal returns to rivals of the merging firms for the full sample period from 1980 to 2009. Panel B reports abnormal returns to rivals of the merging firms for pre-deregulation and post-deregulation sample periods. Panel C reports abnormal returns to rivals based on their subsequent merger activity within one year of any merger announcement. Panel D reports results for tests of difference in means.

	Mean	(t-stat)	Median	%Pos	Max	Min	Std Dev	Rival obs	Merger obs
Panel A: Full Sample Period, 1980 - 2009									
All rivals	0.45%	5.78	-0.11%	48.85%	161.28%	-56.41%	8.40%	11,768	138
Panel B: Sub-Sample Periods									
Pre-deregulation, 1980 - 1995	0.39%	2.76	-0.15%	47.79%	101.16%	-50.72%	7.42%	2,764	42
Post-deregulation, 1996 - 2009	0.47%	5.09	-0.09%	49.18%	161.28%	-56.41%	8.68%	9,004	96
Pre-deregulation (5-year), 1991 - 1995	0.61%	3.57	0.07%	50.99%	55.80%	-50.72%	7.13%	1,761	22
Post-deregulation (5-year), 1996 - 2000	0.63%	5.69	0.11%	50.90%	93.71%	-56.41%	8.61%	5,971	54
Panel C: Sample by Subsequent Merger Activity within	one Year								
Full Sample, 1980 - 2009:									
Subsequent Targets	0.92%	3.14	0.15%	51.67%	50.14%	-41.63%	8.18%	780	136
Subsequent Bidders	0.42%	1.69	0.13%	53.13%	26.97%	-21.20%	4.85%	384	119
Non Targets/Bidders	0.42%	5.03	-0.14%	48.50%	161.28%	-56.41%	8.51%	10,631	138
Pre-deregulation, 1980 - 1995:									
Subsequent Targets	2.01%	2.46	0.43%	54.48%	47.02%	-41.63%	9.43%	134	34
Subsequent Bidders	0.23%	0.74	-0.11%	49.43%	12.77%	-6.29%	2.87%	87	34
Non Targets/Bidders	0.31%	2.12	-0.17%	47.42%	101.16%	-50.72%	7.39%	2,554	42
Post-deregulation, 1996 - 2009:									
Subsequent Targets	0.69%	2.24	0.11%	51.08%	50.14%	-31.31%	7.88%	646	96
Subsequent Bidders	0.47%	1.54	0.17%	54.21%	26.97%	-21.20%	5.29%	297	90
Non Targets/Bidders	0.45%	4.56	-0.13%	48.84%	161.28%	-56.41%	8.84%	8,077	96

Table 4.5 (Continued): Abnormal Returns to Rival of the Merging Firms

This table reports abnormal returns to rivals for various samples of telecom mergers. The abnormal returns are computed as net-of-market returns for a 3-day event window (-1, +1); the CRSP value-weighted index is the market proxy and day 0 is the merger announcement date. Rivals of the merging firms are all publicly traded U.S. telecom firms (SIC codes 4810 to 4813; CRSP Share codes 10 and 11) at the time of the merger announcement and that are neither the target nor bidder in the deal. For an announced merger deal in focus, I exclude from the observations used in the return computations rivals that happen to be targets or bidders in another merger deal announced within the 3-day window of the deal in focus. Panel A reports abnormal returns to rivals of the merging firms for the full sample period from 1980 to 2009. Panel B reports abnormal returns to rivals of the merging firms for pre-deregulation and post-deregulation sample periods. Panel C reports abnormal returns to rivals based on their subsequent merger activity within one year of any merger announcement. Panel D reports results for tests of difference in means.

	Mean	(<i>t</i> -stat)	Median	%Pos	Max	Min	Std Dev	Rival obs	Merger obs
Pre-deregulation (5-year), 1991 - 1995:									
Subsequent Targets	2.03%	2.22	0.51%	56.57%	44.13%	-41.63%	9.08%	99	22
Subsequent Bidders	0.23%	0.61	-0.11%	47.69%	12.77%	-6.29%	3.09%	65	22
Non Targets/Bidders	0.53%	3.02	0.06%	50.81%	55.80%	-50.72%	7.08%	1,608	22
Post-deregulation (5-year), 1996 - 2000:									
Subsequent Targets	1.19%	2.99	0.55%	54.18%	43.86%	-31.31%	8.36%	443	54
Subsequent Bidders	0.79%	2.17	0.30%	55.84%	26.97%	-18.89%	5.53%	231	53
Non Targets/Bidders	0.58%	4.86	0.04%	50.40%	93.71%	-56.41%	8.73%	5,313	54
Panel D: Tests of Difference in Means between Subseq	went Targets and I	Non Targets/H	Bidders						
Full Sample, 1980 - 2009	0.50%	1.66							
Pre-deregulation, 1980 - 1995	1.70%	2.05							
Post-deregulation, 1996 - 2009	0.25%	0.75							
Pre-deregulation (5-year), 1991 - 1995	1.49%	1.60							
Post-deregulation (5-year), 1996 - 2000	0.60%	1.46							

Table 4.6: Abnormal Returns on "Initial" Merger Announcement following Deregulation

This table reports abnormal returns to target, bidder, and combined firms, as well as their rivals, on the initial merger announcement – *acquisition of Pacific Telesis Group by SBC Communications Inc. on April 1, 1996* – following the passage of the Telecommunications Act of 1996. The abnormal returns are computed as net-of-market returns for a 3-day event window (-1, +1) and for other windows to examine possible run-ups of stock prices of merging firms; the CRSP value-weighted index is the market proxy and day 0 is the merger announcement date. Rivals of the merging firms are all publicly traded U.S. telecom firms (SIC codes 4810 to 4813; CRSP Share codes 10 and 11) at the time of the merging firms. Panel B reports abnormal returns to the rivals of the merging firms, as well as abnormal returns to rivals based on their subsequent merger activity within one year the initial merger announcement.

	(-1, +1)	(-5, -2)	(-20, -6)	(-40, -21)	(-40, -2)				
Panel A: Abnormal Returns to Merging Firms									
Target	21.64%	2.12%	-5.45%	-4.96%	-8.29%				
Bidder	-6.97%	0.47%	-2.46%	-7.28%	-9.27%				
Combined	2.83%								
	Mean	(t-stat)	Median	%Pos	Max	Min	Std Dev	Rival obs	
Panel B: Abnormal Returns to Rivals									
All rivals	1.23%	2.34	1.08%	54.84%	16.08%	-14.14%	5.13%	93	
Other Baby Bells	1.88%	8.74	1.66%	100.00%	2.50%	1.32%	0.48%	5	
Rivals by Subsequent Merger Activity n	vithin One Y	ear:							
Subsequent Targets	4.02%	3.07	2.50%	85.71%	8.58%	-0.97%	3.46%	7	
Subsequent Bidders	0.67%	0.59	0.12%	50.00%	6.01%	-1.88%	2.76%	6	
Non Targets/Bidders	1.03%	1.76	0.69%	53.09%	16.08%	-14.14%	5.28%	81	
Panel C: Test of Difference in Means b	etween Subse	quent							
Targets & Non Targets/Bidders	2.99%	2.08							
Targets & Bidders	3.35%	1.94							
Bidders & Non Targets/Bidders	-0.37%	-0.29							

Table 4.7a: Abnormal Returns on "Second" Merger Announcement following Deregulation

This table reports abnormal returns to target, bidder, and combined firms, as well as their rivals, on the initial merger announcement – *acquisition of Cellular Communications Inc. by AirTouch Communications Inc. on April 6, 1996* – following the passage of the Telecommunications Act of 1996. The abnormal returns are computed as net-of-market returns for a 3-day event window (-1, +1) and for other windows to examine possible run-ups of stock prices of merging firms; the CRSP value-weighted index is the market proxy and day 0 is the merger announcement date. Rivals of the merging firms are all publicly traded U.S. telecom firms (SIC codes 4810 to 4813; CRSP Share codes 10 and 11) at the time of the merging firms. Panel B reports abnormal returns to the rivals of the merging firms, as well as abnormal returns to rivals based on their subsequent merger activity within one year the initial merger announcement.

	(-1, +1)	(-5, -2)	(-20, -6)	(-40, -21)	(-40, -2)			
Panel A: Abnormal Returns to Merging Firms								
Target	4.55%	-1.11%	0.50%	0.23%	-0.38%			
Bidder	-0.86%	-4.05%	0.88%	-2.62%	-5.79%			
Combined	-0.66%							
	Mean	(<i>t</i> -stat)	Median	%Pos	Max	Min	Std Dev	Rival obs
Panel B: Abnormal Returns to Rivals								
All rivals	1.34%	1.90	0.41%	55.91%	26.93%	-22.59%	6.88%	93
Rivals by Subsequent Merger Activity w	vithin One Y	ear:						
Subsequent Targets	5.00%	2.12	3.37%	83.33%	14.92%	-2.08%	5.77%	6
Subsequent Bidders	-0.46%	-0.69	0.44%	60.00%	0.97%	-2.92%	1.49%	5
Non Targets or Bidders	1.17%	1.52	0.37%	54.22%	26.93%	-22.59%	7.02%	87
Panel C: Test of Difference in Means b	etween Subse	equent						
Targets & Non Targets/Bidders	3.82%	1.55						
Targets & Bidders	5.45%	2.23						
Bidders & Non Targets/Bidders	-1.63%	-1.62						

Table 4.7b: Abnormal Returns on "Third" Merger Announcement following Deregulation

This table reports abnormal returns to target, bidder, and combined firms, as well as their rivals, on the initial merger announcement – *acquisition of Nynex Corp by Bell Atlantic Corp on April 22, 1996* – following the passage of the Telecommunications Act of 1996. The abnormal returns are computed as net-of-market returns for a 3-day event window (-1, +1) and for other windows to examine possible run-ups of stock prices of merging firms; the CRSP value-weighted index is the market proxy and day 0 is the merger announcement date. Rivals of the merging firms are all publicly traded U.S. telecom firms (SIC codes 4810 to 4813; CRSP Share codes 10 and 11) at the time of the merger announcement and that are neither the target nor bidder in the deal. Panel A reports the abnormal returns to the merging firms. Panel B reports abnormal returns to the rivals of the merging firms, as well as abnormal returns to rivals based on their subsequent merger activity within one year the initial merger announcement.

	(-1, +1)	(-5, -2)	(-20, -6)	(-40, -21)	(-40, -2)			
Panel A: Abnormal Returns to Merging Firms								
Target	-7.91%	2.89%	0.01%	-0.96%	1.94%			
Bidder	4.54%	0.95%	-2.63%	-5.16%	-6.84%			
Combined	-1.15%							
	Mean	(<i>t</i> -stat)	Median	%Pos	Max	Min	Std Dev	Rival obs
Panel B: Abnormal Returns to Rivals								
All rivals	0.34%	0.56	-0.50%	42.86%	34.16%	-12.94%	5.84%	91
Other Baby Bells	1.70%	3.02	1.68%	100.00%	3.11%	0.33%	1.12%	4
Most Significant Rivals as identified by	the FCC:							
AT&T Corp	-1.85%							
MCI Communications Corp	-2.27%							
Sprint Corp	1.69%							
Rivals by Subsequent Merger Activity n	vithin One Y	ear:						
Subsequent Targets	1.94%	0.74	-0.26%	50.00%	10.82%	-2.55%	5.24%	4
Subsequent Bidders	-2.04%	-4.88	-2.25%	0.00%	-1.06%	-2.79%	0.72%	3
Non Targets or Bidders	0.34%	0.53	-0.33%	43.53%	34.16%	-12.94%	5.90%	85
Panel C: Test of Difference in Means b	etween Subse	quent						
Targets & Non Targets/Bidders	1.60%	0.59						
Targets & Bidders	3.98%	1.50						
Bidders & Non Targets/Bidders	-2.37%	-3.10						

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