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Capital Structure and Mergers: Retrospective Evidence from a Natural Experiment

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Abstract This analysis evaluates the impact of corporate debt in influencing mergers of local exchange companies in the United States telecommunications industry between 1988 and 2001. Firms' financial structures significantly affect behavior and performance; yet no evidence has shown how firms' financial structures influence their merger activities. The impact of corporate debt levels on the various mergers that took place during the merger wave in the sector is significantly negative for the first set of mergers carried out, and significantly negative, but with smaller impact, for the second set of mergers. The results support the idea that firms with high debt levels can be monitored carefully, precluding engagement in potentially-risky mergers so as to not engender negative financial outcomes.

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1 Introduction

In the literature, the link between types of financing and firm strategic behavior is crucial. The relationship between a firm's capital structure and strategy is acknowledged as key (Brown et al. 2009), and finance and strategic behavior questions are interrelated (Balakrishnan and Fox 1993). Debt is an important type of funds source (Corbett and Jenkinson 1997), capital structure is measured as the ratio of debt to total capital (Zingales 1998),[1] and the defining feature of two components in a firm's capital structure, debt and equity, are the differential rights of providers (La Porta et al. 1998).

Financial structure matters strategically (Myers 1977; Parsons and Titman 2008), since due to agency, signaling and information asymmetry issues (Ross 1977; Myers and Majluf 1984) there is heterogeneity in firms' financing decisions (Denis and Mihov 2003). The issues of whether to have debt, how much, and what happens are important (Grinblatt and Titman 2001). Relative debt levels impact firms' behavior. The findings in the leverage and strategy literature indicate that increased debt in firms softens aggressive strategic behavior. Titman (1984) evaluates liquidation decisions; Lambrecht (2001) evaluates entry and exit decisions; Phillips (1995) evaluates output and pricing decisions; Chevalier (1995) evaluates strategic responses of firms, while Zingales (1998) highlights the links between capital structure, firm performance and survival; David et al. (2008) evaluate the impact of debt on long-term oriented R&D activities; Anderson and Makhija (1999) evaluate the relationship between debt and corporate growth opportunities in Japan, and Chirinko and Elston (2006) carry out similar analysis for Germany.

Simultaneously, a large literature discusses why firms merge. Reasons posited for mergers are to gain efficiencies (Farrell and Shapiro 1990), obtain reputation advantages (Dranove and Shanley 1995), reduce risk (Amihud and Lev 1981), diversify (Levy and Sarnat 1970), enjoy spillovers (Tremblay and Tremblay 1988), reconfigure resources (Steiner 1975), and redeploy capabilities (Capron and Mitchell 1998). Conversely, negative motives, such as hubris (Roll 1986), also drive mergers. Mergers determine the extent of competition in a market, and create substantial variations in industry structure (Steiner 1975) via the consolidations of firms. The historical evidence shows that concentration-enhancing structural variations permit firms to gain market power (Stigler 1964), to permit a quiet life (Hicks 1935), to grow the firm (Mueller 1969), and to permit rent-extraction (Marris 1964).

In the finance literature, given a takeover or merger decision, a corpus of work (Bessler et al. 2011) evaluates the financial structure of such a deal. Merger transactions account for a large proportion of global gross domestic product. In the United States between 15,000 and 20,000 mergers occurred in the 2000s, and the role of debt in influencing economic activities is profound. There is a knowledge gap, as no evidence exists on how firm's leverage influence takeover or merger decisions. A speculation is that, because of a limited liability effect, taken-over or merging firms with high leverage will compete aggressively (Socorro 2007). There is exploration of the relationship between leverage and merger timing (Morellec and Zhdanov 2005), but the evidence on how leverage affects firms' merger decisions is non-existent.

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[1] Capital structure matters in influencing innovativeness, and financial concerns impact firms' technology performance (Majumdar 2016; Mayer 1990).

1.1 Scope of the Study

The study evaluates the relationship between firms' leverage and mergers. The mergers assessed are all of those occurring among the population of local exchange firms in the United States telecommunications industry in the last two decades. Based on mergers data, the sector provides a natural experiment setting for retrospectively evaluating how leverage had impacted firms' merger propensities.

In infrastructure-based sectors, changes in firms' strategic behavior have raised concerns that high debt levels could be leading to severe firms' financial distress (Bortolotti et al. 2011). For telecommunications firms, the funding of assets such as spectrum and new networks would cost very large sums of money. Conversely, limits on abilities to raise prices, because of intense competition or effective regulation, would compromise the interest-paying capacities of such firms if they were to be highly indebted. Thus, strategies likely to compromise debt servicing would be considered risky, and risky strategic behavior of relatively greater-leveraged telecommunications firms would be constrained.

Based on recent capital structure research (Majumdar 2016), we evaluate the relationship between firms' leverage and mergers of local exchange firms in the United States telecommunications industry. Past mergers that have been approved are natural experiments, so that pre- and post-merger assessments can be carried out, permitting an evaluation of competition policy decisions. If, after evaluation of an allowed merger, subsequent outcomes, measured via analysis of firms' behavior, are below expectations, then results indicate that competition agencies may not have got economic assumptions right (Carlton 2009).

The use of historical panel data, from 1988 to 2001, of almost all the local exchange carriers in the United States, containing pre and post-merger data for firms, for two uniquely-different institutional periods, enables tracking of dynamic merger history for each carrier (Majumdar et al. 2012). Table 1 (extracted from Majumdar et al. 2014), lists ownership status and merger activity of local exchange telecommunications companies before 1996. Table 2 lists post-1996 merger events.

Two issues can be investigated by retrospective merger assessments. First, whether specific merger decisions were right or wrong can be assessed. Second, the detailed evaluation of a stream of mergers permits an understanding of the outcomes of competition and merger policies. Retrospective assessments of consummated mergers have been reviewed by Hunter et al. (2008), Kwoka Jr (2013) and Pautler (2003). These historical assessments generate performance metrics useful for competition policy development (Kovacic 2006). Retrospective merger appraisals permit the accumulation of knowledge about various behavioral, structural and competitive conditions in different industries. By engaging in retrospective analyses, it is possible to highlight conditions under which merger outcomes are positive or negative. If these conditions can be established, then conclusions can be generalized to develop heuristics that provide policy insights in evaluating mergers based on expected outcomes in terms of price, and impact on other economic parameters.

2 Theory and Institutional Facts

2.1 Debt and Mergers

There are no clear propositions about the impact of leverage on mergers. One literature, on leverage and aggressiveness in strategic behavior, is based on the long-purse argument (Telser

Table 1 Status of firms and merger activity in the local exchange sector of the US telecommunications industry before the passage of the telecommunications act of 1996

Company Names	Status 1988 to 1995
Illinois Bell Telephone Company*	An original Ameritech company
Indiana Bell Telephone Company Inc.*	An original Ameritech company
Michigan Bell Telephone Company*	An original Ameritech company
The Ohio Bell Telephone Company*	An original Ameritech company
Wisconsin Bell Inc. *	An original Ameritech company
Chesapeake & Potomac Telephone Company*	An original Bell Atlantic Company which became Verizon in 2000
Chesapeake & Potomac Telephone Company of Maryland*	An original Bell Atlantic Company which became Verizon in 2000
Chesapeake & Potomac Telephone Company of Virginia*	An original Bell Atlantic Company which became Verizon in 2000
Chesapeake & Potomac Telephone Company of West Virginia*	An original Bell Atlantic Company which became Verizon in 2000
The Diamond State Telephone Company*	An original Bell Atlantic Company which became Verizon in 2000
The Bell Telephone Company of Pennsylvania*	An original Bell Atlantic Company which became Verizon in 2000
South Central Bell Telephone Company*	Stayed independent with operations amalgamated as Bell South in 1992
Southern Bell Telephone & Telegraph Company*	Stayed independent with operations amalgamated as Bell South in 1992
Bell South*	Stayed independent with operations amalgamated as Bell South in 1992
New Jersey Bell Telephone Company*	An original Bell Atlantic Company which became Verizon in 2000
New England Telephone & Telegraph Company*	An original NYNEX Company
New York Telephone*	An original NYNEX Company
Nevada Bell*	An original Pacific Telesis Company
Pacific Bell*	An original Pacific Telesis Company
Southwestern Bell Telephone Company*	Stayed independent
The Mountain States Telephone and Telegraph Company*	Stayed independent till 1990 and operations amalgamated as US West Communications since 1991
Northwestern Bell Telephone Company*	Stayed independent till 1990 and operations amalgamated as US West Communications since 1991
Pacific Northwest Bell Telephone Company*	Stayed independent till 1990 and operations amalgamated as US West Communications since 1991
U S West Communications, Inc. *	Combined operations of Mountain States Telephone and Telegraph Company, Northwestern Bell Telephone Company and Pacific Northwest Bell Telephone Company from 1991
Cincinnati Bell Telephone Company*	Stayed independent
The Southern New England Telephone Company*	Stayed independent
Central Telephone Company of Virginia*	Became a part of Sprint in 1992
Contel of New York*	Became a part of GTE in 1990
Citizens Telecommunications Company Of New York Inc.	Stayed independent
Contel of Texas*	Became a part of GTE in 1990
Contel of Virginia*	Became a part of GTE in 1990
Contel of California Inc. *	Became a part of GTE in 1990
GTE California, Inc.	An original GTE Company
GTE Florida, Inc. *	An original GTE Company
GTE Hawaiian Telephone Company, Inc. *	An original GTE Company
Contel of Missouri Inc. *	Became a part of GTE in 1990
GTE Midwest Inc.	An original GTE Company

Table 1 (continued)

Company Names	Status 1988 to 1995
GTE North, Inc. *	An original GTE Company
GTE Northwest, Inc. *	An original GTE Company
GTE South, Inc.	An original GTE Company
GTE Southwest, Inc.	An original GTE Company
Lincoln Telephone & Telegraph Company*	Stayed independent
Puerto Rico Telephone Company*	An original GTE Company
Rochester Telephone Corporation*	Stayed independent
Carolina Telephone & Telegraph Company*	Became a part of Sprint in 1991
United Inter-Mountain Telephone Company*	Became a part of Sprint in 1991
Central Telephone Company of Florida*	Became a part of Sprint in 1992
United Telephone Company of Florida*	Became a part of Sprint in 1991
United Telephone Company of Indiana*	Became a part of Sprint in 1991
United Telephone Company of Missouri*	Became a part of Sprint in 1991
United Telephone Company of Ohio*	Became a part of Sprint in 1991
United Telephone Company of Pennsylvania*	Became a part of Sprint in 1991

Reproduced and redeveloped from Majumdar et al. (2014). This table describes the corpus of M&A activity for the population of the local exchange telecommunications companies including change in ownership, merger or acquisitions before the passage of the Telecommunications Act 1996

*Company details used in the analysis. Some companies' data aggregated and then ratios calculated for the years operations were amalgamated

1966), suggesting that having ready access to capital allows a firm to sustain losses until it succeeds in eliminating competition. A firm with low leverage can raise more debt. This will enable it to behave aggressively. A firm with higher leverage can be vulnerable to competitors' aggressive behavior. The presence of high debt levels provides opportunities for rivals to weaken firms financially by aggressive strategies. Highly-leveraged firms cannot respond similarly, since financial outcomes can be negative. Hence, mergers can be risky actions.

Firms with high debt levels are monitored. They may require periodic re-financing, and negative financial parameters can lead to re-financing denial. Hence, firms with high leverage will be passive to not engender negative financial outcomes (Poitevin 1989), and high leverage levels is associated with a less aggressive strategic stance (Showalter 1995). Concomitantly, firms with lower leverage can signal potential to compete aggressively because of their ability to later tap into additional resources, and be less prone to creditors' pressures (Poitevin 1989).

Converse arguments are proposed. Lower leverage can be associated with less aggressive behavior (Brander and Lewis 1986). Managers in firms with higher leverage will promote aggressive strategies, because equity holders with limited liability will lose to the extent of their capital. They can afford to sustain uncertain outcomes from risky strategies. Mergers can be risky strategies, in spite of the benefits espoused, given the overwhelming evidence, in the literature, that mergers do not work (Andrade et al. 2001; Datta et al. 1992).

Managers will be aware of merger vicissitudes. Thus, firms may engage in risky mergers, while espousing positive efficiency-enhancing, resource-pooling and technology-spreading gains, anticipating low probability of outcomes. In such cases, higher leverage permits firms to engage in a risky strategy knowing that likely negative outcomes will be borne to a limited extent by firms' owners as negative financial consequences are passed on to debt holders.

Table 2 Status of firms and merger activity in the local exchange sector of the US telecommunications industry after the passage of the telecommunications act of 1996

Company Names	Status 1996 to 2001
Illinois Bell Telephone Company*	Became a part of SBC in 1999
Indiana Bell Telephone Company Inc.*	Became a part of SBC in 1999
Michigan Bell Telephone Company*	Became a part of SBC in 1999
The Ohio Bell Telephone Company*	Became a part of SBC in 1999
Wisconsin Bell Inc. *	Became a part of SBC in 1999
Chesapeake & Potomac Telephone Company*	An original Bell Atlantic Company which became Verizon in 2000
Chesapeake & Potomac Telephone Company of Maryland*	An original Bell Atlantic Company which became Verizon in 2000
Chesapeake & Potomac Telephone Company of Virginia*	An original Bell Atlantic Company which became Verizon in 2000
Chesapeake & Potomac Telephone Company of West Virginia*	An original Bell Atlantic Company which became Verizon in 2000
The Diamond State Telephone Company*	An original Bell Atlantic Company which became Verizon in 2000
The Bell Telephone Company of Pennsylvania*	An original Bell Atlantic Company which became Verizon in 2000
South Central Bell Telephone Company*	Stayed independent with operations amalgamated as Bell South in 1992
Southern Bell Telephone & Telegraph Company*	Stayed independent with operations amalgamated as Bell South in 1992
Bell South*	Stayed independent with operations amalgamated as Bell South in 1992
New Jersey Bell Telephone Company*	An original Bell Atlantic Company which became Verizon in 2000
New England Telephone & Telegraph Company*	An original NYNEX Company which became a Bell Atlantic Company in 1997 which became Verizon in 2000
New York Telephone*	An original NYNEX Company which became a Bell Atlantic Company in 1997 which became Verizon in 2000
Nevada Bell*	Became a part of SBC in 1997
Pacific Bell*	Became a part of SBC in 1997
Southwestern Bell Telephone Company*	Stayed independent
The Mountain States Telephone and Telegraph Company*	Became a part of Qwest in 2000
Northwestern Bell Telephone Company*	Became a part of Qwest in 2000
Pacific Northwest Bell Telephone Company*	Became a part of Qwest in 2000
U S West Communications, Inc. *	Became a part of Qwest in 2000
Cincinnati Bell Telephone Company*	Stayed independent
The Southern New England Telephone Company*	Became a part of SBC in 1998
Central Telephone Company of Virginia*	Stayed as a part of Sprint
Contel of New York*	Stayed as part of GTE which then became part of Verizon in 2000
Citizens Telecommunications Company Of New York Inc.	Stayed independent
Contel of Texas*	Stayed as part of GTE which then became part of Verizon in 2000
Contel of Virginia*	Stayed as part of GTE which then became part of Verizon in 2000
Contel of California Inc. *	Stayed as part of GTE which then became part of Verizon in 2000
GTE California, Inc.	Became a part of Verizon with GTE takeover in 2000
GTE Florida, Inc. *	Became a part of Verizon with GTE takeover in 2000
GTE Hawaiian Telephone Company, Inc. *	Became a part of Verizon with GTE takeover in 2000
Contel of Missouri Inc. *	Stayed as part of GTE which then became part of Verizon in 2000

Table 2 (continued)

Company Names	Status 1996 to 2001
GTE Midwest Inc.	Became a part of Verizon with GTE takeover in 2000
GTE North, Inc. *	Became a part of Verizon with GTE takeover in 2000
GTE Northwest, Inc. *	Became a part of Verizon with GTE takeover in 2000
GTE South, Inc.	Became a part of Verizon with GTE takeover in 2000
GTE Southwest, Inc.	Became a part of Verizon with GTE takeover in 2000
Lincoln Telephone & Telegraph Company*	Stayed independent
Puerto Rico Telephone Company*	Became a part of Verizon with GTE takeover in 2000
Rochester Telephone Corporation*	Became a part of Global Crossing in 1999 and Citizens Communications in 2001
Carolina Telephone & Telegraph Company*	Stayed as part of Sprint
United Inter-Mountain Telephone Company*	Stayed as part of Sprint
Central Telephone Company of Florida*	Stayed as part of Sprint
United Telephone Company of Florida*	Stayed as part of Sprint
United Telephone Company of Indiana*	Stayed as part of Sprint
United Telephone Company of Missouri*	Stayed as part of Sprint
United Telephone Company of Ohio*	Stayed as part of Sprint
United Telephone Company of Pennsylvania*	Stayed as part of Sprint

Reproduced and redeveloped from Majumdar et al. (2014). This table describes the corpus of M&A activity for the population of the local exchange telecommunications companies including change in ownership, merger or acquisitions after the passage of the Telecommunications Act 1996

*Company details used in the analysis. Some companies' data aggregated and then ratios calculated for the years operations were amalgamated

2.2 Institutional Change and Mergers

Because firms' decisions are driven by context changes (Nelson and Winter 1982), environmental factors play a role in influencing firms. Industry shocks, such as changes in technology or in the regulatory environment, can lead to sequential mergers (Fauli-Oller 2000).[2] Triggers for resource re-configuration are contingent on environment changes (Ambrosini et al. 2009). Thus, engaging in mergers is capability enhancement by firms (Teece et al. 1997), as mergers lead to reconfiguration of resources (Capron and Mitchell 1998). Mergers allow firms to restructure business activities (Steiner 1975). As part of a process in which firms with excess resources buy less well-endowed firms, mergers permit usage of combined resources to improve merged-firm capabilities (Pleatsikas and Teece 2001). Reconfigurations economies include those from rationalization, stemming from disposal of duplicate assets, and restructuring arising from the recombination of capabilities (Brodley 1987). These activities release resources for other activities.

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[2] Given rapid industry changes, sequential mergers can increase market power and permit firms to obtain performance-enhancing economies of scale (Farrell and Shapiro 1990). Nevertheless, the participation of firms in several successive mergers compounds the positive and negative expectations that providers of debt associate with mergers.

2.3 Telecommunications Mergers and Hypothesis

The flow of merger events is described next, and summarized in Table 1. In 1984, with the break-up of the old AT&T, the sector consisted of 7 regional holding companies (RHCs), which owned 22 stand-alone Bell operating companies (BOCs). There were 5 other groupings: Central Telephone, Continental Telephone, GTE, Southern New England Telephone and United Telephone, and two large independent companies: Cincinnati Bell and Rochester Telephone. These groupings owned several ILECs. Merger deals were takeover of ILECs by RHCs or other groupings. See Tables 1 and 2 for details. After a merger deal, ILECs' ownership was transferred from one holding company to another.

A first set of mergers occurred between the 1984 divestiture and the introduction of legislation in 1996. We have classified these as pre-1996 mergers. In the early 1990s, several RHCs amalgamated separate stand-alone ILECs. In 1991, the operations of Mountain States Telephone and Telegraph Company, Northwestern Bell Telephone Company and Pacific Northwest Bell Telephone Company were combined to form US West Communications. In 1992, the amalgamation of South Central Bell Telephone Company and Southern Bell Telephone and Telegraph Company operations, as Bell South, took place. These were successful units that were consolidated for the purposes of exploiting economies of scope.

Simultaneously, several non-RHC groupings, with less-than adequate financial resources, or that were territorially disparate, were acquired by other groupings. Thus, Continental merged its companies, such as Contel of California, Contel of New York, Contel of Virginia and Contel of Texas with GTE. These events occurred in 1990. Thereafter, the operating companies belonging to United were acquired by Sprint in 1991 which became a holding company. Later, the operating companies of Central Telephone Company were acquired by Sprint in 1992.

A second series of mergers occurred after the 1996 legislation. These extremely-large mergers were significant attention-receiving events in the industry (Hazlett 2000), intended to exploit opened-market possibilities (Goldman et al. 2003). We have classified these as post-1996 mergers. The key mergers, by deal size, were the merger of SBC and Pacific Telesis, in April 1996, between two RHCs; the merger of Bell Atlantic and NYNEX, in April 1996, between two RHCs; the merger of WorldCom and MCI, in October 1997, between two IXCs; the merger of AT&T and TCI, in May 1998, between an IXC and a cable operator; and the merger of SBC and Ameritech, in June 1998, between two RHCs.

The 1996 legislation, having opened the local exchange market to entry by CLECs, motivated performance- and growth-enhancing mergers among unattached RHCs. For example, Pacific Telesis, under financial strain in California, was merged with Southwestern Bell Corporation (SBC). To expand it national scope of operations, SBC acquired Southern New England Telephone (SNET) in 1998. In addition, inter-modal competitive threats from the cable sector emerged.[3]

Several RHCs acquired other groupings. Ameritech was acquired by SBC, to obtain financial scale for a major presence in all United States local markets. In 2000, GTE was acquired by Bell Atlantic. Bell Atlantic had also earlier acquired NYNEX, an RHC in its own right. The conglomerate Bell Atlantic re-named itself Verizon. The motive was to bring

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[3] AT&T, the long-distance company, purchased the cable companies, TCI, Media One and Lenfest by 1999. It purchased the downtown Boston assets of Cable Vision, all for over $100 billion. The AT&T cable business could provide major competition to the local exchange carriers.

together complementary assets and strengths, create scale and scope economies, permit innovations and accelerate delivery of advanced services. Additionally, a motive was to tackle competition from cable giants such as AT&T.

Several ILECs went through two mergers. The Continental ILECs went through two mergers. First, they were acquired by GTE. Then, GTE became part of Bell Atlantic. Similarly, the GTE and NYNEX local exchange companies went through two mergers. The first was when they were acquired by Bell Atlantic. The second was when Bell Atlantic acquired Puerto Rico Telephone Company and then re-named the whole group, consisting of erstwhile Bell Atlantic, Contel, GTE, NYNEX and Puerto Rico Telephone Company, as Verizon. Pacific Telesis was first absorbed into SBC. Then, Ameritech was absorbed into SBC and the entire SBC structure recast.

Given institutional conditions, we state our expectations. The institutional environments had been different before and after 1996 in the telecommunications industry. Before 1996, the local exchange sector consisted of regulated monopolies, where each firm had a pre-demarcated market with no competition possible due to entry barriers. We have noted that the impact of the 1996 legislation had been vital in inducing entry by IXCs, CLECs and CSOs in incumbents' markets. The pre- and post-legislation historical environments had been different, affecting firms' strategies (Cave et al. 2002).

Institutional entry barriers were eliminated after 1996. Entry in firms' territories became extensive. In such circumstances, after due scanning and searching, firms might engage in mergers to enhance resources for gaining competitive strength and seize new opportunities. Yet, in spite of capability-augmenting possibilities, mergers could be a risky strategy because of de-novo introduction of competition in historically-regulated environments. Nevertheless, firms might engage in mergers to ward off later competitiveness problems or enjoy new market opportunities. Though efficiency-enhancing, resource-pooling and technology-spreading gains could be theoretically feasible, firms could anticipate a lower probability of these outcomes in a competitive environment, relative to a regulated milieu experienced earlier. In such cases, in anticipations of negative outcomes, higher leverage could constrain firms from undergoing an ownership change.

A greater likelihood of negative financial outcomes could limit funds for meeting interest costs and capital repayments. Thus, value of debt-holders' security might be compromised. A flow of funds stoppage possibility, in an infrastructure sector, would have many implications. Given debt as an important source of funds, if merger strategies could create negative financial outcomes, with interest payments delayed and debts rolled over, these contingencies could preclude further lending.

3 Analysis

3.1 Data

We assess the impact of debt on mergers using a panel data set. Data are available for each firm for the full period during which it was under prior and, after takeover, new ownership. The data have been used many times for sector analyses (Majumdar et al. 2012). A balanced panel from the Statistics of Communications Common Carriers (SCCC) are used for the period 1988 to 2001. Data are compiled for the principal local operating companies. These companies account for 99 % of the telephone lines in the United States.

3.2 Merger Variables

A merger dummy variable denotes the occurrence of a takeover or ownership-change event. These merger events correlate with a list of mergers maintained at www.cybertelecom.org. The design of dummy variables to control for merger impact is based on prior research (Gugler and Yurtoglu 2004; Majumdar et al. 2012). First, the merger variable (First Merger) is constructed for all first takeover or merger events. Second, for a few firms a Second Merger variables is also constructed, as some of the firms engaged in a sequence of mergers. The second mergers occurred 1996, when the Telecommunications Act was passed.

The way the firms keep financial records, based on accounting and regulatory requirements, each firm retains its accounting identity. Even if a firm has been taken over, by merger, this accounting identity remains and the data reported for the period 1988 to 2001 are based on these accounts-reporting identities. For every firm after merger, its behavior relative to itself in the past, when it had not merged, or relative to other firms in the same period can be evaluated (Majumdar et al. 2012). This facility also applies to identification of separate reasons behind each takeover.

Table 3 lists variables used and their definitions. The data property permits a pre- and post-merger evaluation of outcomes for the same set of firms over a long time-period, a type of analysis in demand (Carlton 2009). A merger dummy variable for merger and acquisition events denotes an event occurrence. The impact of leverage on merger events are evaluated.

4 Estimation

4.1 Treatment Effects Modeling

A merger occurrence is endogenous, but taking-on debt is also endogenous, as a firm's debt level is not exogenously given (Parsons and Titman 2008). The literature (Mackay and Phillips 2005; Titman and Wessels 1988) has extensively dealt with endogeneity of debt, and why firms borrow. Micro-econometric causality analysis helps ascertain factors influencing higher debt, given that relative leverage can influence mergers.

In causality analysis of debt and mergers, the debt endogeneity concern (Parsons and Titman 2008) is tackled using the treatment effects approach, in which a dummy explanatory variable denotes the existence of an endogenous phenomenon the impact of which is evaluated on an outcome variable (Heckman 2005).

Firms with greater than average borrowing, measured as above median borrowings, subject themselves to a treatment. The treatment occurrence is given by the transition from below-median to above-median borrowing. Its outcome is evaluated in terms of resulting merger activity. A transition from below-median to above-median borrowing will have been a treatment experienced. Such a transition involves changes in behavior influencing merger activity.

The choice of whether to engage in a treatment is endogenous involving a selection bias, since not all firms will have engaged in such a transition but a selected set of firms. The treatment effects approach is applied in assessing how having greater leverage influences firms' subsequent mergers. A treatment effects model considers the median borrowing variable as a covariate influencing mergers, after median borrowing has been modeled as a dummy endogenous variable influenced by other exogenous variables. Selection bias arises because

Table 3 List of explanatory variables

Variable	Description
Leverage	Ratio of total long term debt to total assets
Efficiency	Ratio of digital lines to analog lines
Financial Performance	Ratio of total operating revenues to total assets
Broadband	Ratio of Broadband line to total lines
Business	Ratio of firm's business lines relative to total lines
Urban	Weighted average ratio of urban population to total population
Market Share	Ratio of firm's lines in states of operations relative to total lines in those states
Competition	Number of competitors given a license to operate in the various states.
Growth	Growth in Sales
Size	Log of total assets
Performance	Ratio of operating revenues to total tangible assets
Assets	Ratio of total long term assets to total assets
Other Incentive Scheme	Other incentive regulation
Earnings Sharing Scheme	Earnings share regulation
Hybrid Price Caps Scheme	Hybrid price caps regulation
Pure Price Caps Scheme	Pure price caps regulation
Section 271	Dummy if Section 271 is applicable; related to the procedures established in the communications act by which a Bell operating company may seek to provide services originating in one of its in-region States
Competitive Intensity	Ratio of competitors in a firm's territory relative to the average number of industry competitors
AT&T Cable	Dummy variable coded as 1 for the years of AT&T ownership of cable assets, and 0 otherwise
Interest Rate	Interest rate on 30-year long term U. S. Treasury bonds

treated firms differ from non-treated firms for reasons other than the treatment status, per-se. The process of incurring above-median borrowings is conditioned by several factors, as self-selection into treatment is at play when financial programs, like raising debt, are decided on by firms.

Treatment effect models (Hirano et al. 2003; Rubin 1974) permit natural experiments to be assessed, where a response function, identifying strategic behavior, in this case of firms merging, embodies the effect of interest after the onset of an internal decision or institutional policy (White 2006). Natural experiments are identifiable discrete shifts in within-firm or outside-firm environments such that there is a significant change in behavior (Angrist and Krueger 2001).[4]

4.2 Variables in the Outcome Equation

We use the First Merger and Second Merger as two separate dependent variables in outcome equations. In a treatment effects model, the treatment variable is a 1, 0 variable. We create the explanatory variable in the primary outcome equations as a measure of each local exchange company's leverage (Leverage), which is coded as a binary indicator with the value of 1 which denotes if a firm has above median debt, relative to other firms, and it is coded as 0 denoting if a firm has below median debt, relative to other firms, in that time period.

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[4] The treatment effects model is described in Guo and Fraser (2010).

Other control variables are included in the outcome equations. Mergers are driven by performance enhancement motives, and contemporaneous and performance indicators are used as merger-influencing variables; contemporaneous (Efficiency) and lagged (Efficiency$_{t-1}$) ratios of total operating expenses to total plant in service measures efficiency, and contemporaneous (Financial Performance) as well as lagged (Financial Performance$_{t-1}$) ratios of total operating revenues to total assets measure financial performance (Cornett and Tehranian 1992).

Since mergers are capability-acquisition activities, relative technology deployment levels will affect mergers. The quantum of fiber cabling is used as an indicator of technological capabilities, since fiber is the key broadband resource in a communications environment; thus, contemporaneous (Broadband) and lagged (Broadband$_{t-1}$) ratios of fiber optic cabling to total lines are used as explanatory variables.

Environmental factors likely to affect mergers are business lines and urban population ratios (Sharkey 2002). The business lines construct (Business) is the ratio of business lines to total access lines for each company. The urban population ratio (Urban) is the weighted average ratio of urban population to total population in each firm's territory. This ratio is weighted by the fraction of lines each firm has operating rights to in a specific territory. The use of market share constructs proxies for market presence, though in regulated industries a high market share does not necessarily imply monopoly power (Spulber 2002). The market share variable (Market Share) is constructed by taking the ratio of a firm's lines in its operating territory relative to the total lines in the territory.

To control for industry-related factors, we use an: intensity of competition (Competition) variable. The competition variable is the number of possible competitors given a license to operate in the various states. This variable represents the intensity of market competition in each territory. The competition data are collected from the FCC Competition in Telecommunications Industry reports. For each incumbent local exchange carrier, the competition variable is computed as the sum of the number of competitive local exchange carriers operating in the incumbent's territory.

4.3 Covariates Determining Leverage

This analysis is extensively based on Majumdar (2016). The extent of firms' leverage indicates expectations about earnings capacities and abilities to repay debts. Yet, on what factors drive debt levels, there is no universal set of covariates determining leverage (Myers 2003). Factors relevant in explaining leverage variations are contingent on time and place specificities (Simerly and Li 2000), industry factors (Vincente-Lorente 2001), and firm-specific attributes (Kayhan and Titman 2007).

The relevant surveys (Frank and Goyal 2009; Harris and Raviv 1991; Rajan and Zingales 1995) highlight the covariates influencing leverage. Leverage increases with fixed assets, non-debt tax shields, growth opportunities, and firm size; it decreases with volatility, spending on intangible assets and superior economic performance (Harris and Raviv 1991). Others (Rajan and Zingales 1995) highlight firm size, profitability, possession of tangible assets and firm growth opportunities as variables significantly impacting leverage.

Frank and Goyal (2009) find six factors accounting for more than 27 % of leverage variations, with other factors contributing 2 %. Firms in industries where the median firm has high leverage have high leverage; firms with greater tangible assets have higher leverage; firms with higher profits have lower leverage; larger firms have higher

leverage; and firms with higher market-to-book ratios have lower leverage. While many of these measures are not applicable to our study since many of these telecommunications companies were not publicly traded at the time, we attempt to include as many of these measures as our data sample permits.

4.4 Variables in the Selection Equation

Given the literature, the following are included as explanatory variables in the selection equation for Leverage: contemporaneous as well as lagged sales growth (Growth and Growth$_{t-1}$), firm size (Size) measured as the log of total assets, financial performance (Performance) which is an asset utilization ratio, an important driver of profitability, measured as the ratio of operating revenues to total tangible assets, and the ratio of total long term assets to total assets (Assets).

4.5 Regulatory Factors and Leverage

Institutional contingencies are relevant for regulated industries, where output prices are regulated. Regulated entities, such as electric utilities and telecommunications firms, in the United States have high leverage (Barclay et al. 2003). Firms subject to rate of return regulation choose high leverage because interest costs are included in the rate base for calculating allowable returns (Dasgupta and Nanda 1993; Spiegel 1996; Spiegel and Spulber 1994).

Regulators have incentives to set high regulated prices to lower the probability of regulated firms becoming financially distressed, allowing interest costs to pass-through to customers and hence permitting higher leverage to occur (Spiegel and Spulber 1994). Price regulation in output markets provides regulated firms with incentives to use higher debt to finance operations, and the introduction of innovative regulations lowers leverage (Ovtchinnikov 2010).

Sector regulation changes have been important. The occurrence of regulatory changes is modeled in assessing the extent of leverage. A shift in risk, from a firm's customers to its shareholders, can follow from changes in pricing regulations, from rate of return to incentive regulation schemes such as a price cap regulation (Laffont and Tirole 1993). These institutional changes alter the nature of agency costs regulators face, and trigger changes in firms' incentives for reducing costs (Sappington 2002), as a result of which firms may reduce debt levels to reduce interest burdens. Hence, a shift away from a rate of return regime, to alternative schemes, can significantly influence debt levels in firms.

4.5.1 Regulation Variables in the Selection Equation

Based on the discussion, explanatory variables reflecting the nature of price regulation are included in the selection equation. There have been two types of regulation over prices in the telecommunications sector of the United States; the rate of return and price cap regulation schemes (Sappington 2002). Introduced in 1990, by 2001 over 40 states had implemented price cap regulations. In 1985 there were 50 states with rate of return schemes. By 2001, that number was six. Other incentive schemes were also implemented (Sappington 2002).

Data on telecommunications sector regulatory changes have been used in many other works surveyed in Sappington (2002). We construct variables for five different types of regulatory schemes: Rate of Return Schemes, Other Incentive Schemes, Earnings Sharing Schemes,

Hybrid Price Caps, and Pure Price Caps. The base case regulatory scheme, left out in estimation and used for comparison purposes, is the Rate of Return Schemes variable.

4.5.2 Institutional Variables in the Selection Equation

Institutional factors influence firm financing (La Porta et al. 1998; Majumdar 2016). Thus, covariates are included in the selection equation to account for sector-specific institutional contingencies. In the sector, the Telecommunications Act of 1996 has required firms meet certain requirements, under Section 271 of the act, before they enter long distance markets (Economides 1999). Based on Section 271 approvals data (Brown and Zimmerman 2004), a dummy variable (Section 271) is added for the observations obtaining such approvals.

A competition intensity variable is the ratio of competitors in a firm's territory relative to the average number of industry competitors (Competitive Intensity), based on the available data for competitive entrants given a license to operate in firms' territories. An important related factor is inter-modal competition (Loomis and Swann 2005). A dummy variable (AT&T Cable), coded as 1 for the years of AT&T ownership of cable assets, and 0 otherwise, is included to account for inter-modal competition.

4.6 Financial Market Considerations and Leverage

The structure of interest rates predicts real economic activity (Fama 1986; McKinnon 1973). The issue is, does the level of interest rates influence borrowings, and do such borrowings influence capital investments? Since Friedman and Schwartz (1963) highlighted the importance of monetary policies in influencing real sector activities, short-term interest rates have been used to influence the cost of capital and spending (Bernanke and Gertler 1995). Monetary policy changes lead to balance sheet restructuring, including of leverage (Adrian and Shin 2010). Financial policies propagate shocks. These constraints affect firms' leverage (Korajczyk and Levy 2003).

The evidence on policy-induced constraints, however, is mixed. Monetary policy actions may be followed by real output movements lasting two or more years (Bernanke and Blinder 1992); a higher real funds rate has been associated with lower growth in future real output, with the negative correlation interpreted as high interest rates implying low investment opportunities (Estrella and Hardouvelis 1991). Further analysis finds insignificant (Laurent 1988), or mixed evidence that interest rates impact real economic activity (Harvey 1988). Bernanke and Gertler (1995) state that the quantitative identification of interest rate and financial effects on spending remains difficult, and that non-financial factors may influence spending patterns. Analysis also shows that a small proportion of the real output variance in the United States in the last five decades has been attributable to monetary policy shifts (Leeper et al. 1996). Interest rates may not affect leverage, since expenditures are planned ahead and subject to non-monetary influences (Woodford 2003).

4.6.1 Financial Variables in the Selection Equation

In assessing macro-economic factors impacting firm level financial decisions, financial market controls are required. Two variables used are the interest rate on 30-year long term U. S.

Treasury bonds (Interest Rate) and a variable measuring period-to-period changes in interest rates (Interest Rate Change).

5 Results

5.1 Findings and Interpretation

The results are in Tables 4 and 5, and relate to the treatment effects specification of the leverage and merger relationships. There are five columns of results for the selection and outcome equations in each table. In Table 4 and model (1), the First Merger variable is introduced on its own, with no controls added. In model (2), along with the First Merger variable all of the control variables are added.

Efficiency gains are a major reason for mergers (Farrell and Shapiro 1990), and in model (3) just the prior efficiency variables are included to assess whether their stand-alone effects lead the debt variable to stay the same in magnitude. The levels of past financial performance, reconfiguration of resources and redeployment of capabilities (Steiner 1975) are other reasons noted as merger motivators. In model (4) the efficiency and capability-related variables are included, while in model (5) the financial performance and capability-related variables are included. In Table 5, results for the Second Merger variable are detailed. The models are as for the First Merger variable. In Table 4 models (1) to (5), the debt variable, Leverage, has been negative and significant ($p < 0.01$). In Table 5 models (1) to (5), the Leverage variable is also negative and significant ($p < 0.01$). The results support the hypothesis advanced.

Because the dependent variables, First Merger and Second Merger, are 1, 0 dummy variables, as is the Leverage variable, the impact of Leverage on mergers can be interpreted as the probability of merger disapproval, in the case of a negative coefficient, and merger support in case of a positive coefficient. Taking the results of models (1) to (5), with respect to the First Merger variable, the presence of above median debt in firms, as measured by the Leverage variable, leads to an average 75% lower likelihood of a first merger occurrence. Based on the results of models (1) to (5), with respect to the Second Merger variable, the presence of greater debt leads to a 10% lower likelihood of a second merger occurrence. The results stay consistent across the specifications. The telecommunications sector evidence shows that debt negatively affects the merger predilections of the firms studied.

There are two opposite predictions about the impact of firm leverage on mergers. Our results are interpreted in the light of the institutional features of the sector. Given the postulates of the long purse argument (Telser 1966), requiring access to capital, to allow firms to bear negative outcomes until competitive success ensued, firms with low leverage might raise more debt to enable them to behave aggressively. Firms with higher leverage might be vulnerable to competitors' aggression. High debt levels could engender weakening by other nimble rivals, and older-established firms could become unresponsive to events. Hence, mergers could be risky. Such firms would be monitored, given re-financing requirements, and firms with high leverage would be passive to avoid negative fiscal outcomes. Thus, high leverage levels would be associated with less aggressive behavior by firms, and correspondingly with lower merger propensity.

The first set of mergers by firms in the sector were carried out to consolidate resources. These early events were driven by performance-enhancing considerations. Many smaller firms such as Continental Telephone, Central Telephone and United

Table 4 Treatments effects estimation results for the first merger outcome variable

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Outcome variable: first merger					
Constant	0.826*** (0.052)	2.556 (4.095)	0.753 (0.131)	1.151 (0.203)	0.439** (0.276)
Leverage	−0.796*** (0.087)	−0.691*** (0.082)	−0.807*** (0.090)	−0.771*** (0.078)	−0.699*** (0.080)
Efficiency		1.317 (2.886)	0.322 (3.087)	0.080 (2.835)	
Efficiency$_{t-1}$		−2.114 (2.921)	0.767 (2.993)	1.373 (2.793)	
Financial Performance		−0.810* (0.553)			−0.721* (0.533)
Financial Performance$_{t-1}$		1.786*** (0.570)			1.642*** (0.537)
Broadband		0.959 (2.074)			0.994 (2.076)
Broadband$_{t-1}$		0.318 (2.011)			0.285 (2.010)
Business		−1.646*** (0.358)		−1.727*** (0.358)	−1.639*** (0.356)
Urban		0.327* (0.220)		0.067 (0.199)	0.327* (0.220)
Market Share		−0.180** (0.069)		−0.220*** (0.062)	−0.178** (0.069)
Competition		0.006*** (0.001)		0.007*** (0.001)	0.006*** (0.001)
Wald χ^2	82.41	224.14	82.38	204.45	223.92
Selection equations for leverage treatment variable					
Constant	−1.056 (0.888)	0.444 (1.014)	−1.147* (0.899)	0.569 (0.957)	0.448 (1.005)
Growth	−0.519 (0.436)	−0.507 (0.683)	−0.512 (0.447)	−0.354 (0.460)	−0.507 (0.712)
Growth$_{t-1}$	0.004 (0.026)	0.0003 (0.028)	0.004 (0.026)	0.001 (0.027)	0.003 (0.028)
Size	0.097* (0.035)	0.020 (0.040)	0.093** (0.035)	0.026 (0.039)	0.018 (0.045)
Performance	−2.046* (1.278)	−3.608** (1.536)	−1.643 (1.468)	−3.500** (1.488)	−3.469** (1.429)
Assets	−0.793* (0.546)	−0.675 (0.611)	−0.758* (0.545)	−0.849* (0.571)	−0.678 (0.610)
Other Incentive Schemes	−0.148 (0.148)	−0.087 (0.159)	−0.156 (0.148)	−0.127 (0.154)	−0.096 (0.157)
Earnings Sharing Schemes	−0.041 (0.164)	−0.104 (0.178)	−0.055 (0.165)	−0.169 (0.172)	−0.116 (0.175)
Hybrid Price Caps	−0.57*** (0.190)	−0.731*** (0.212)	−0.587*** (0.189)	−0.767*** (0.281)	−0.747*** (0.208)
Pure Price Caps	−0.065 (0.143)	0.027 (0.154)	−0.073 (0.142)	−0.050 (0.148)	0.020 (0.151)
Section 271	−0.115 (0.297)	−0.057 (0.342)	−0.090 (0.297)	−0.004 (0.321)	−0.037 (0.337)
Competitive Intensity	0.060* (0.035)	0.173*** (0.041)	0.059* (0.035)	0.189*** (0.040)	0.176*** (0.040)
AT&T Cable	−0.065*** (0.134)	−0.619*** (0.131)	−0.652*** (0.134)	−0.664*** (0.127)	−0.621*** (0.131)
Interest Rate	0.196*** (0.070)	0.176*** (0.076)	0.193*** (0.070)	0.167** (0.074)	0.173** (0.076)
Interest Rate Change	−0000 (0.003)	0.00 (0.003)	−0.000 (0.003)	0.000 (0.000)	0.000 (0.000)
Atanh ρ	1.399	1.304	1.424	1.392	1.310
Log σ	−0.417	−0.561	−0.411	−0.515	−0.559

Table 4 (continued)

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
P	0.885	0.862	0.890	0.884	0.864
Σ	0.658	0.571	0.662	0.597	0.572
Λ	0.582	0.492	0.590	0.528	0.494
LR Test χ^2	59.81***	36.23***	58.69***	65.96***	38.84***
N	509	509	509	509	509

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; standard errors in parentheses

Table 5 Treatments effects estimation results for the second merger outcome variable

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Outcome variable: second merger					
Constant	0.056*** (0.007)	0.069 (0.057)	0.085*** (0.024)	0.075** (0.041)	0.063 (0.055)
Leverage	−0.095*** (0.012)	−0.103*** (0.012)	−0.094*** (0.012)	−0.091*** (0.013)	−0.106*** (0.011)
Efficiency		−1.495** (0.567)	−1.585*** (0.531)	−1.520** (0.534)	
Efficiency$_{t-1}$		1.268** (0.595)	1.144* (0.558)	1.133** (0.558)	
Financial Performance		−0.035 (0.116)			−0.147* (0.108)
Financial Performance$_{t-1}$		−0.082 (0.121)			0.024 (0.110)
Broadband		0.906** (0.421)			−0.980** (0.423)
Broadband$_{t-1}$		1.283*** (0.404)			1.325*** (0.406)
Business		−0.094 (0.072)		−0.140** (0.072)	−0.101* (0.073)
Urban		0.065* (0.044)		0.045 (0.040)	0.060* (0.045)
Market Share		0.032** (0.013)		0.010 (0.011)	0.033** (0.013)
Competition		0.000 (0.000)		−0.000 (0.000)	0.000 (0.000)
Wald χ^2	58.67	100.16	66.13	68.04	97.05
Selection equations for leverage treatment variable					
Constant	1.169 (1.113)	1.975* (1.122)	1.494 (1.127)	1.536 (1.152)	1.755* (1.106)
Growth	0.794** (0.413)	0.915** (0.416)	0.741** (0.424)	0.740* (0.429)	0.924** (0.405)
Growth$_{t-1}$	0.015 (0.033)	0.014 (0.032)	0.016 (0.033)	0.016 (0.033)	0.013 (0.032)
Size	0.022 (0.041)	0.017 (0.043)	0.025 (0.042)	0.032 (0.044)	0.020 (0.043)
Performance	−4.923*** (1.502)	−7.242*** (1.594)	−5.988*** (1.565)	−6.242*** (1.589)	−6.651*** (1.535)
Assets	0.669 (0.699)	0.656 (0.690)	0.569 (0.705)	0.525 (0.716)	0.678 (0.682)
Other Incentive Schemes	−0.107 (0.176)	−0.092 (0.178)	−0.081 (0.179)	−0.096 (0.182)	−0.107 (0.175)
Earnings Sharing Schemes	0.149 (0.201)	0.111 (0.201)	0.182 (0.203)	0.147 (0.207)	0.084 (0.197)
Hybrid Price Caps	−0.308 (0.271)	−0.350 (0.271)	−0.275 (0.276)	−0.305 (0.281)	−0.374* (0.266)
Pure Price Caps	−0.143 (0.179)	−0.188 (0.181)	−0.100 (0.181)	−0.133 (0.185)	−0.228 (0.177)
Section 271	0.227 (0.416)	0.221 (0.410)	0.174 (0.418)	0.190 (0.423)	0.267 (0.407)
Competitive Intensity	0.102** (0.043)	0.121 (0.044)	0.107*** (0.004)	0.106** (0.045)	0.117** (0.044)
AT&T Cable	−0.409** (0.157)	−0.412** (0.157)	−0.381** (0.159)	−0.359** (0.161)	−0.418** (0.154)
Interest Rate	−0.032 (0.084)	−0.018 (0.085)	−0.025 (0.085)	−0.024 (0.087)	−0.021 (0.083)
Interest Rate Change	0.005 (0.004)	0.004 (0.004)	0.004 (0.004)	0.004 (0.004)	0.004 (0.004)
Atanh ρ	0.767	0.817	0.746	0.728	0.842
Log σ	−2.299	−2.309	−2.313	−2.322	−2.295

Table 5 (continued)

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
P	0.645	0.674	0.632	0.622	0.687
Σ	0.100	0.099	0.098	0.098	0.101
Λ	0.065	0.067	0.062	0.061	0.069
LR Test χ^2	18.50***	24.81***	16.86***	15.29***	28.24***
N	509	509	509	509	509

Telephone consolidated their operations at that time. In the late 1980s and early 1990s, mergers were also carried out to gain scope economies, such that the combined entity could tackle larger players with deeper pockets.

Hence, a-priori weak telecommunications firms were merging to form stronger firms. In such circumstances, the presence of higher-than-average debt would enhance the riskiness of such firms. Thus, for first mergers the presence of high leverage led to higher propensity, as given by the size of the Leverage coefficient, to not merge, as compared to the impact of high leverage on second mergers which led to a lowering of the intensity of the negative propensity to merge.

Most of the second mergers were carried out to exploit opportunities after the passage of the market-opening legislation. The first notable telecommunications merger of this genre was between Pacific Telesis and Southwestern Bell. Many of latter-period telecommunications mergers were undertaken by bigger firms that then became Verizon and AT&T (the former SBC), to gain size and market presence. The latter-period mergers involved numerous companies which progressed through more than one merger event. Several sequential telecommunications mergers were undertaken to gain enhanced competitive leverage in evolving markets which would become contestable, given new entrants' presence (Ferguson 2004).

Such scaling-up of telecommunications firms' operations and activities would reduce the risk associated with higher leverage; nevertheless, risk would still exist in a highly-competitive business environment. Removal of restrictions, that would have been keeping other types of communications firms from entering local exchange markets, would bring in an assortment of IXCs, CAPs, CLECs and CSOs to offer services to incumbent companies' customers (Woroch 2002). While size of incumbent companies might mitigate environmental uncertainties, risks might have remained large enough to ensure that the relationships between higher leverage and merger propensity would be remaining negative.

5.2 An Alternative Explanation

An alternative explanation, based on ideas expressed elsewhere (Majumdar 2016) from which this discussion is abridged, is suggested. Debt can be relational and transactional (Berger and Udell 1995), a classification similar to insider and outsider debt (Carey et al. 1998). Bank and financial institution loans are relational debts. Bonds and securities are transactional debts (Bhattacharya et al. 2004). Transaction lending is arms-length (Boot and Thakor 2000). A firm could have many transactional lenders. Because of free-riding, such lenders would not be able to engender collective action against firms' managers to constrain managers' risky strategies, such as engaging in mergers, and the lenders could face hold-up problems.

Conversely, relational debt-holder could influence firms' strategies. Firms with a single lender would face pressures to engage in growth-enhancing opportunities (Houston and James 1996), as well as constraints hindering them from taking risky decisions. This would be borrower holdup by monopolistic bank creditors (Sharpe 1990), given that bank lenders would have been insiders (Ivashina et al. 2009). Such relational lenders could monitor borrowers to obtain information for interventions, and lending would involve receiving proprietary information (Allen 1990) used in multiple interactions (Greenbaum and Thakor 1995). If firms proposed to engage in possibly-risky strategies, such as large mergers, relationship-based lenders could exert pressures to constrain such behaviors.

In old-established industries facing oversight, such as telecommunications (Woroch 2002), lenders and firms would have engaged in business relationships and interacted for decades

(Majumdar 2016). Over time there would have been repeated interactions between borrowers and lenders. Hence, if telecommunications firms were to take decisions involving large amounts on mergers, with the possibility of uncertain outcomes, the lenders would constrain firms' activities so as to preserve financial performance outcomes and the security of sums lent by them. Thus, a negative relationship between high leverage and the occurrence of mergers would be likely to be observed.

6 Conclusion

Mergers are important phenomena with impacts on competition policy, strategy and economic performance. The analysis has considered the impact of corporate debt in influencing mergers among the population of United States local exchange companies between 1988 and 2001 How mergers are influenced is important. Yet, there has been no evidence as to how firms' financial structures influence mergers. Our analysis is the first, we are aware of, to examine the relationship between firm leverage and merger propensity, an important issue given high debt concerns. The extent of firm leverage can significantly influence merger decisions, either in retarding or promoting them. There are complexities involved in analyses of debt and mergers, because of the endogeneity of financial decisions by firms. The literatures have dealt with the extent of debt as a strategic decision to be modeled, using a range of covariates to explain the debt-choice decision. The need to account for debt as an endogenous variable is important, and the extent of debt as a strategic choice has been appropriately modeled.

We model debt-choice as an endogenous process, and augment the policy and corporate finance literatures by demonstrating the disentangling of complexities inherent in simultaneously evaluating corporate financing and merger decisions. For this evaluation, we use treatment effects modeling. This enables selection effects in strategic choice decisions, such as the taking-on of debt, to be accounted for. The technique enables the analysis of causality implicit in simultaneous strategic leverage and merger decisions. The use of treatment effects modeling advances analyses of firms' strategic behavior in competition policy and economic analyses. Our results have shown that the impact of relatively higher corporate debt levels on merger events in the sector has been negative. The results are consistent with the idea of monitoring of firms with high debt levels; and such firms will be strategically passive, by not undertaking in risky mergers so as not to engender potentially-negative financial performance outcomes.

References

Adrian T, Shin HS (2010) Liquidity and leverage. J Financ Intermed 19:418–437
Allen F (1990) The market for information and the origin of financial intermediation. J Financ Intermed 1:3–30
Ambrosini V, Bowman C, Collier N (2009) Dynamic capabilities: an exploration of how firms renew their resource base. Br J Manag 20(S1):S9–S24
Amihud Y, Lev B (1981) Risk reduction as a managerial motive for conglomerate mergers. Bell J Econ 12(2): 605–617

Anderson CW, Makhija AK (1999) Deregulation, disintermediation, and agency costs of debt: evidence from Japan. J Financ Econ 51:309–339

Andrade G, Mitchell M, Stafford E (2001) New evidence and perspective on mergers. J Econ Perspect 15:103–120

Angrist J, Krueger A (2001) Instrumental variables and the search for identification: from supply and demand to natural experiments. J Econ Perspect 15(4):69–85

Balakrishnan S, Fox I (1993) Asset specificity, firm heterogeneity and capital structure. Strateg Manag J 14:3–16

Barclay MJ, Marx L, Smith C (2003) The joint determination of leverage and maturity. J Corp Finan 9:149–167

Berger A, Udell GF (1995) Relationship lending and lines of credit in small firm finance. J Bus 68:351–381

Bernanke BS, Blinder A (1992) The Federal Funds Rate and the channels of monetary transmission. Am Econ Rev 82:901–921

Bernanke BS, Gertler M (1995) Inside the black box: the credit channel of monetary policy transmission. J Econ Perspect 9(4):27–48

Bessler W, Drobetz W, Zimmerman J (2011) Financing corporate mergers and acquisitions. In: Baker HK, Martin GS (eds) Capital structure and corporate financing decisions: theory, evidence, and practice. Wiley, New York, pp 419–444

Bhattacharya S, Boot AWA, Thakor A (2004) Credit, intermediation and the macro economy: models and perspectives. Oxford University Press, Oxford

Boot AWA, Thakor A (2000) Can relationship banking survive competition? J Financ 55:679–713

Bortolotti B, Cambini C, Rondi L, Spiegel Y (2011) Capital structure and regulation: do ownership and regulatory independence matter? J Econ Manag Strateg 20(2):517–564

Brander JA, Lewis TR (1986) Oligopoly and financial structure: the limited liability effect. Am Econ Rev 76:956–970

Brodley J (1987) The economic goals of antitrust: efficiency, consumer welfare and technological progress. New York University Law Review 62:1020–1053

Brown KS, Zimmerman PR (2004) The effect of section 271 on competitive entry into local telecommunications markets: an initial evaluation. Inf Econ Policy 16:215–233

Brown JR, Fazzari SM, Petersen BC (2009) Financing innovation and growth: cash flow, external equity, and the 1990s R&D boom. Journal of Finance, LXIV 1:151–185

Capron L, Mitchell W (1998) The role of acquisitions in reshaping business capabilities in the international telecommunications industry. Ind Corp Chang 7(4):715–730

Carey M, Post M, Sharpe SA (1998) Does corporate lending by banks and finance companies differ? Evidence on specialization in private debt contracting. J Financ 53:845–878

Carlton DW (2009) Why we need to measure the effect of merger policy and how to do it. Competition Policy International 5(1):77–90

Cave ME, Majumdar SK, Vogelsang I (2002) Structure, regulation and competition in the telecommunications industry. In: Cave ME, Majumdar SK, Vogelsang I (eds) Handbook of telecommunications economics. North-Holland, Amsterdam, pp 1–40

Chevalier JA (1995) Capital structure and product-market competition: empirical evidence from the supermarket industry. Am Econ Rev 85:415–435

Chirinko R, Elston JA (2006) Finance, control and profitability: the influence of German banks. J Econ Behav Organ 59(1):69–88

Corbett J, Jenkinson T (1997) How is investment financed? A study of Germany, Japan, the United Kingdom and the United States. The Manchester school, 65(Supplement), 69-93

Cornett MM, Tehranian H (1992) Changes in corporate performance associated with Bank acquisitions. J Financ Econ 31:211–234

Dasgupta S, Nanda V (1993) Bargaining and brinkmanship: capital structure choice by regulated firms. Int J Ind Organ 11:475–497

Datta DK, Pinches GP, Narayanan VK (1992) Factors influencing wealth creation from mergers and acquisitions: a meta-analysis. Strateg Manag J 13(1):67–84

David P, O'Brien J, Yoshikawa T, (2008): The implications of debt heterogeneity for R&D investment and firm performance, Acad Manag J, 51, 165-181.

Denis DJ, Mihov VT (2003) The choice among bank debt, non-bank private debt and public debt: evidence from new corporate borrowings. J Financ Econ 70:3–28

Dranove D, Shanley M (1995) Cost reductions or reputation enhancement as motives for mergers: the logic of multihospital systems. Strateg Manag J 16(1):55–74

Economides N (1999) The telecommunications act of 1996 and its impact. Jpn World Econ 11(4):455–483

Estrella A, Hardouvelis G (1991) The term structure as a predictor of real economic activity. J Financ 46:555–576

Fama E (1986) Term premiums and default premiums in money markets. J Financ Econ 17:175–196

Farrell J, Shapiro C (1990) Horizontal mergers: an equilibrium analysis. Am Econ Rev 80(1):107–126

Fauli-Oller R (2000) Takeover waves. J Econ Manag Strateg 9:189–210

Ferguson C (2004) The broadband problem: anatomy of a market failure and a policy dilemma. Brookings Institution Press, Washington

Frank MZ, Goyal VK (2009) Capital structure decisions: which factors are reliably important? Financ Manag 38: 1–37

Friedman M, Schwartz AJ (1963) A monetary history of the United States, 1867–1960. Princeton University Press, Princeton

Goldman C, Gotts I, Piaskoski M (2003) The role of efficiencies in telecommunications merger review. Federal Communications Law Journal 56(1):87–144

Greenbaum SI, Thakor AV (1995) Contemporary financial intermediation. Dryden Press, New York

Grinblatt M, Titman S (2001) Financial markets and corporate strategy. McGraw-Hill, New York

Gugler K, Yurtoglu B (2004) The effects of mergers on company employment in the USA and Europe. Int J Ind Organ 22:481–502

Guo S, Fraser MW (2010) Propensity score analysis: statistical methods and applications. Sage Publications, Inc, Thousand Oaks

Harris M, Raviv A (1991) The theory of capital structure. J Financ 46:297–356

Harvey CR (1988) The real term structure and consumption growth. J Financ Econ 22:305–333

Hazlett T (2000) Economic and political consequences of the 1996 telecommunications act. Regulation 23(3): 36–45

Heckman JJ (2005) The scientific model of causality. Sociol Methodol 35:1–97

Hicks JR (1935) Annual survey of economic theory: the theory of monopoly. Econometrica 3:1–20

Hirano KG, Imbens G, Ridder G (2003) Efficient estimation of average treatment effects using the estimated propensity score. Econometrica 71:1161–1189

Houston J, James C (1996) Bank information monopolies and the mix of private and public debt claims. J Financ 51:1863–1889

Hunter G, Leonard GK, Olley GS (2008) Merger retrospective studies: a review. Antitrust 23(1):34–41

Ivashina V, Nair V, Saunders A, Massoud N, Stover R (2009) Bank debt and corporate governance. Rev Financ Stud 22(1):41–77

Kayhan A, Titman S (2007) Firms' histories and their capital structures. J Financ Econ 83:1–32

Korajczyk RA, Levy A (2003) Capital structure choice: macroeconomic conditions and financial constraints. J Financ Econ 68:75–109

Kovacic WE (2006) Using ex post evaluations to improve the performance of competition policy authorities. Journal of Corporation Law 31(2):503–547

Kwoka JE Jr (2013) Does merger control work? A retrospective on U. S. Enforcement actions and merger outcomes. Antitrust Law Journal 78(3):619–650

La Porta R, Lopez-de-Silanes F, Shleifer A, Vishny RW (1998) Law and finance. J Polit Econ 106(6):1113–1155

Laffont J-J, Tirole J (1993) A theory of incentives in procurement and regulation. MIT Press, Cambridge

Lambrecht B (2001) The impact of debt financing on entry and exit in a duopoly. Rev Financ Stud 14:765–804

Laurent RD (1988) An interest rate-based indicator of monetary policy. Federal Reserve Bank of Chicago. Econ Perspect 12:3–14

Leeper EM, Sims CA, Zha T (1996) What does monetary policy do? Brook Pap Econ Act 27(2):1–78

Levy H, Sarnat M (1970) Diversification, portfolio analysis, and the uneasy case for conglomerate mergers. J Financ 25:795–802

Loomis DG, Swann CM (2005) Inter-modal competition in local exchange markets. Inf Econ Policy 17:97–113

MacKay P, Phillips GM (2005) How Does Industry Affect Firm Financial Structure? Rev Financ Stud, 18, 4, 1433–1466

Majumdar SK (2016) Debt and communications technology diffusion: retrospective evidence. Res Policy 45(2): 458–474

Majumdar SK, Moussawi R, Yaylacicegi U (2012) Mergers and synergy: lessons from contemporary telecommunications history. Telecommun Policy 36(2):140–154

Majumdar SK, Moussawi R, Yaylacicegi U (2014) Do incumbents' mergers influence entrepreneurial entry? An evaluation. Enterp Theory Pract 38(3):601–633

Marris R (1964) The economic theory of managerial capitalism. Macmillan, London

Mayer C (1990) Financial systems, corporate finance and economic development. In: Hubbard RG (ed) Asymmetric information, corporate finance and investment. University of Chicago Press, Chicago

McKinnon RI (1973) Money and Capital in Economic Development. Brookings Institution, Washington, DC

Morellec E, Zhdanov A (2005) The dynamics of mergers and acquisitions. J Financ Econ 77:649–672

Mueller D (1969) A theory of conglomerate mergers. Q J Econ 83:643–651

Myers SC (1977) Determinants of corporate borrowing. J Financ Econ 5:147–175

Myers SC (2003) Financing of corporations. In: Constantinides G, Harris M, Stulz R (eds) Handbook of the economics of finance: corporate finance Vol 1A. North Holland, Amsterdam, pp 215–253

Myers SC, Majluf N (1984) Corporate financing and investment decisions when firms have information investors do not have. J Financ Econ 131:187–221

Nelson RR, Winter SG (1982) The evolutionary theory of economic change. Belknap Press of the Harvard University Press, Cambridge

Ovtchinnikov A (2010) Capital structure decisions: evidence from deregulated industries. J Financ Econ 95(2): 249–274

Parsons C, Titman S (2008) Capital structure and corporate strategy, handbook of corporate finance: empirical corporate finance, volume 2. In Espen Eckbo B. (ed),Amsterdam: North-Holland, pp 203-234

Pautler PA (2003) Evidence on mergers and acquisitions. Antitrust Bulletin 48:119–221

Phillips GM (1995) Increased debt and industry product markets: an empirical analysis. J Financ Econ 37:189–238

Pleatsikas C, Teece D (2001) The analysis of market definition and market power in the context of rapid innovation. Int J Ind Organ 19:665–693

Poitevin M (1989) Financial signaling and the deep pocket argument. RAND J Econ 20:26–40

Rajan RG, Zingales L (1995) What do we know about capital structure? Some evidence from international data. J Financ 50(5):1421–1460

Roll R (1986) The hubris hypothesis of corporate takeovers. J Bus 59(2):197–216

Ross S (1977) The determination of financial structure: the incentive signaling approach. Bell J Econ 8:1–32

Rubin D (1974) Estimating causal effects of treatments in randomized and non-randomized studies. J Educ Psychol 66:688–701

Sappington D (2002) Price Regulation. In: Cave ME, Majumdar SK, Vogelsang I (eds) Handbook of telecommunications economics. North-Holland, Amsterdam

Sharkey WW (2002) Representation of technology and production. In: Cave ME, Majumdar SK, Vogelsang I (eds) Handbook of telecommunications economics. North-Holland, Amsterdam

Sharpe S (1990) Asymmetric information, bank lending and implicit contracts: a stylized model of customer relationships. J Financ 45:1069–1087

Showalter DM (1995) Oligopoly and financial structure: comment. Am Econ Rev 85:647–653

Simerly RL, Li M (2000) Environmental dynamism, capital structure and performance: a theoretical integration and an empirical test. Strateg Manag J 21(1):31–49

Socorro MP (2007) Mergers under uncertainty: the effects of debt financing. Manchester School 75(5):580–597

Spiegel Y (1996) The choice of technology and capital structure under rate regulation. Int J Ind Organ 15:191–216

Spiegel Y, Spulber DF (1994) The capital structure of a regulated firm. RAND J Econ 25:424–440

Spulber D (2002) Competition policy in telecommunications. In: Cave ME, Majumdar SK, Vogelsang I (eds) Handbook of telecommunications economics. North-Holland, Amsterdam

Steiner PO (1975) Mergers: motives, effects, policies. University of Michigan Press, Ann Arbor

Stigler GJ (1964) A theory of oligopoly. J Polit Econ 72:55–59

Teece DJ, Pisano G, Shuen A (1997) Dynamic capabilities and strategic management. Strateg Manag J 18:509–533

Telser LG (1966) Cutthroat competition and the long purse. J Law Econ 9:259–277

Titman S (1984) The effect of capital structure on a firm's liquidation decision. J Financ Econ 13:137–151

Titman S, Wessels R (1988) The determinants of capital structure choice, J. Financ, 43, 1–19

Tremblay VJ, Tremblay CH (1988) The determinants of horizontal acquisitions: evidence from the US brewing industry. J Ind Econ 37:21–45

Vincente-Lorente JD (2001) Specificity and opacity as resource-based determinants of capital structure: evidence for Spanish manufacturing firms. Strateg Manag J 22(2):157–177

White H (2006) Time series estimation of the effects of natural experiments. J Econ 135:527–566

Woodford M (2003) Interest and prices: foundations of a theory of monetary policy. Princeton University Press, Princeton

Woroch GA (2002) Local network competition. In: Cave ME, Majumdar SK, Vogelsang I (eds) Handbook of telecommunications economics. North Holland, Amsterdam, pp 641–716

Zingales L (1998) Survival of the fittest or the fattest? Exit and financing in the trucking industry. J Financ 53: 905–938