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Acquisitions as a Response to Deregulation: Evidence from the Cable Television Industry

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Abstract

This paper studies the dynamics of an industry that is subject to exclusive geographical licensing. I develop a model of license ownership that predicts the evolution of profit-maximizing entry and acquisition decisions by firms over time, starting from an initial allocation of licenses. The entry and acquisition process is modeled as a one-sided coalition-formation game as in Farrell and Scotchmer (1988), where acquisition payoffs depend on economies of scale and agglomeration (economies of density). I estimate the model for the cable television industry in Canada using a panel that I have constructed from 1990 to 1996. The dataset builds up from the national regulator's license-ownership decision files, and contains license-level information on acquisition decisions, subscribership, and subscription profits. The model is estimated in two steps. I first estimate firms' license-level profit functions, and then estimate the parameters of the fixed, merger and entry cost functions by Simulated Maximum Likelihood. Through counterfactual simulations, I use the estimated model to quantify the extent to which economies of scale and density drive acquisition behaviour, and to evaluate how merger activity reacts to a partial deregulation that occurs in 1994. Counterfactual experiments are also used to evaluate policies that stimulate entry or reduce acquisitions in the early years of the sample. The main finding is that these policies can lead to more productive dominant firms in the long-run as the industry consolidates.

JEL Classification: L12, L22, L96, G34

Keywords: Acquisition, Entry, Coalition Formation, Economies of Density, Economies of Scale, Simulated Maximum Likelihood, Cable Television

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1 Introduction

In this paper, I develop and estimate a model of acquisitions and entry for an industry that is subject to exclusive geographic licensing. I apply the model to the Canadian cable television industry, and estimate its parameters using a panel containing information on firms' acquisition and entry decisions, geographic locations, and license-level profits. I have constructed these data using the individual acquisition and entry decision files of the national regulator for the industry over the 1990-1996 period.[1]

This paper provides a unique, in-depth empirical analysis of the determinants of mergers. I evaluate how economies of scale and density (i.e.: agglomeration) affects firms' acquisition incentives, and how deregulation can trigger merger activity. The estimated model is also used to study policies that stimulate entry behaviour, or reduce acquisitions in the early years of the industry's life-cycle. Given the industry is likely to consolidate over time because of scale effects, the question is to what extent policymakers can help ensure that the emerging dominant firms are productive, and do not grow based on scale merit-alone. Although the results from these policy experiments are specific to the cable television industry, they are informative for entry and merger policy for industries where scale effects are present, and dominant firms are likely to arise in the long-run.

The acquisition and entry model that the analysis is based on explicitly accounts for the interdependency and mutual exclusivity of firms' merger and entry decisions. There are three key features of the industry and data that keeps the model tractable, and that allows me to identify the impact that economies of scale, density and deregulation have on acquisition behaviour. Over my entire sample period, firms are *local monopolists* within their licenses. This allows me to abstract from modeling complications related to oligopolistic product-market competition, such as business stealing incentives or market power motives for acquisition.[2] Across the local monopolies, my dataset contains information on *firms' profits at the license-level*. Therefore, I can estimate the profit function of cable companies directly, a luxury empirical studies of market structure typically

[1]I use the words acquisition, merger, and buyout interchangeably. This study focuses however on acquisitions, where there is a selling firm that ceases to exist following a merger. That is, I do not study "mergers of equals."

[2]Examples of entry/exit models with network competition that attempt to deal with these difficulties include the seminal work of Seim (2006), and more recently by Aguirregabiria and Ho (2009).

do not have.[3] This often restricts researchers' ability to control for location and firm unobserved heterogeneity in profits, something that these data allow me to account for. Moreover, the profit data reveal a scale effect on profits: all else equal, large cable companies (in terms of national subscribership) earn more profits per-subscriber than small ones. This gives large firms an incentive to acquire the licenses of small firms, as larger companies can earn higher profits than the status quo. Finally, I exploit the fact that a *partial deregulation* occurs within my sample period. Using variation in firms' channel offerings and profits before and after the policy change, I find that large cable companies take advantage of the policy by offering new channels to its subscribers, while smaller firms do not. My estimates show that this increases large firms' profitability advantage. Using the model, I quantify the extent to which this change in the scale effect is responsible for the observed rise in acquisitions that follows the deregulation.

My acquisition and entry model is based on a cooperative, one-sided coalition formation game as in Farrell and Scotchmer (1988). Starting from an initial allocation of licenses to firms, in each period (year) cable companies make irreversible merger and entry decisions that affects the license allocation, and that determines the set of cable companies that play the acquisition game in the next period. For a given allocation of licenses within a year, firms earn profits from their set of licenses. The amount of surplus generated by a merger depends on three main factors: (1) the relative size of the buying and selling firms (which affects relative profitability through a scale effect), (2) an agglomeration effect, as merging firms can reduce their overall fixed costs per license (related to local administrative and technical expenses) if they own licenses that are geographically proximate, and (3) firm heterogeneity, which captures differences in unobservables that affect profits (such as managerial ability or firm productivity). The equilibrium of the game is characterized by a stability condition, where for a given set of merger and entry arrangements, no collection of firms can profitability deviate from their arrangements.

The model is estimated in two steps. First, I estimate a per-subscriber variable profit function using within-license variation in subscription profits, firm size, and local demographics, while con-

[3] In the absence of profit data, authors infer the parameters of profit functions in entry/exit studies by rationalizing the observed entry/exit decisions of firms in the data. This revealed preference approach to profit function estimation dates back to Bresnahan and Reiss (1991). Jia (2008) is a recent example that takes such an approach.

trolling for firm and license unobserved heterogeneity. To account for the impact that the 1994 policy change has on firms' profits, I estimate different variable profit functions for the pre (1990-1994) and post (1995-1996) regulatory periods. In the second step, the parameters of the fixed, merger, and entry cost functions are estimated using data on firms' acquisition and entry decisions, their geographic locations, and predictions for the additional variable profits generated by mergers, that are computed using the estimated profit function. The second-step parameters are estimated by Simulated Maximum Likelihood, where the likelihood for the model is constructed using inequalities implied by the equilibrium conditions of the acquisition and entry game.

The estimation results provide various empirical findings on the determinants of acquisitions. As noted, large cable companies earn more profits per-subscriber than do small ones, and that these differentials are magnified by the 1994 policy change. My counterfactual experiments show that these firm size effects are the main driver of acquisition behaviour in the industry. When I remove the scale effect on profits and simulate data using the model, acquisition levels fall dramatically. The model also predicts that the deregulation is largely responsible for the spike in acquisition behaviour that follows the policy change. In the absence of the impact that deregulation has on firms' profit functions, my simulations show that acquisitions do not spike in 1995 as they do in the data. Economies of density are found to have a modest effect on firms' acquisition incentives. Given the geographic clustering of firms' license ownership in the data, this result is somewhat surprising. It highlights the importance of accounting for scale effects when estimating the impact that economies of density have on firms' acquisition incentives.

Using the estimated model, I also conduct two sets of policy experiments that study entry subsidies, and policies that restrict merger activity (for example, through regulator-imposed acquisition fees) in the industry's infancy. I find that both of these policies can yield more productive dominant firms in the long-run as the industry consolidates. Entry subsidies make it easier for productive entrants to enter and acquire relatively unproductive incumbents. Acquisition fees reduce merger activity in the early years of the industry's life-cycle, helping prevent large cable companies from forming. If large companies emerge early on, they develop scale advantages that allow them to continue to grow by acquiring smaller cable operators. However, since entrants typically enter the industry by acquiring small cable companies (as acquisition costs scale with incumbent size), scale-driven acquisitions by initially large incumbents can prevent the entry of productive entrants who would otherwise acquire relatively unproductive incumbents. That is, large incumbent scale-effects can overwhelm any productivity differences between incumbents and new entrants if incumbents grow too fast. By slowing the initial rate of consolidation, merger policy can help ensure that productive entrants can enter the industry. By creating a rich pool of initial entrants, these policies can ensure that dominant firms emerge in the long-run due to their intrinsic productivity advantages as well as scale effects, and not because of scale effects alone.

This paper relates to a large empirical literature on merger waves, which consists of descriptive, aggregate industry-level studies. Andrade, Mitchell and Stafford (2001) provide a comprehensive overview of this literature. They emphasize that industrial shocks, such as deregulation and technological change, are fundamental to the merger waves experienced by various industries in the U.S. during the 1980's and 1990's. I provide a microeconometric analysis of a merger wave that follows a well-identified regulatory change within an industry. Further, I identify a mechanism through a merger wave occurs by estimating an equilibrium model firms' acquisition and entry decisions.

I also contribute to an empirical literature on market structure and agglomeration. Jia (2008), Holmes (2008) and Ellickson et. al (2008) all study the impact that economies of density have on the spread of Walmart and other retail chains in the U.S.. Aguirregabiria and Vincentini (2006) develop methods for estimating dynamic, spatial, multi-store entry models that focus on economies of density and firms' pre-emption incentives. Akkus and Hortaçsu (2007) use maximum score methods to study bank mergers in a spatial environment, and find that firms of similar size and in geographic proximity are more likely to merge. My findings provide new empirical insights on how market structure can be shaped by buyouts, and how dominant firms can emerge through their acquisition of smaller companies over time, in industries where economies of scale are present.

The rest of the paper is organized as follows. In Section 2 I provide an overview of the Canadian cable television industry. The data and empirical facts are highlighted in Section 3. I develop a model of acquisitions and entry in Section 4, and outline my estimation strategy in Section 5. My empirical findings and counterfactual analyses are presented in Section 6, and Section 7 concludes.

2 Cable Television in Canada

Since 1986, cable companies in Canada have been regulated at the national level by the Canadian Radio-television and Telecommunications Commission (CRTC), according to the *Cable Television Regulations* (the Regulations), which were enacted in subsection 16(1) of the Broadcasting Act. Prior to 2001, a primary feature of the Regulations is the issuance of geographical licenses from the CRTC to cable operators, that gives companies exclusive rights to be the sole cable provider within pre-defined Local Service Areas (LSAs). LSAs are defined by the CRTC, and typically correspond to cities, towns, municipalities or villages. Prior to the entry of Direct Broadcast Satellite (DBS) in 1998, exclusive licenses gives local cable companies monopoly rights over the provision of cable services within their LSAs. Licenses do not involve fees of any sort, are defined over 3-5 year time horizons (at the end of which they are renewable), and can be revoked by the CRTC at any time.

Cable companies extract rents from subscribers within their LSAs by offering tiered cable bundles in the form of basic, extended basic, and specialty cable packages. The latter two tiers constitute 'non-basic' or 'discretionary' service, both of which involve a tying requirement: subscribers must sign up for basic cable before purchasing any packages from the non-basic tier. The price and channel composition of the bundles are affected by the Regulations, as the CRTC imposes basic price regulation, and channel carriage restrictions nationwide. Basic price regulation puts an upper bound on the allowable increase in basic prices from year to year.[4] Carriage restrictions involve three primary components. First, they contain "must carry" provisions that force cable companies to carry all local over-the-air channels in their basic packages. Second, the CRTC regulates the universe of channels that may be offered by cable companies. It does so by offering licenses to channel providers that allow them to transmit their signals to Canadian cable companies. Finally, Canadian content provisions require that cable companies show a fixed proportion of hours of Canadian-based programming.[5] Up until 1999, cable companies' primary source of profits comes from their cable

[4]The upper bound on basic price growth is determined by the inflation rate, capital cost allowances, and whether cable companies are in financial distress. LSAs with less than 2000 subscribers are not subject to basic price regulations so as to give cable companies an additional incentive to operate in smaller, rural areas.

[5]As of 2009, content rules require at least 60% of all programming between 6:00am and midnight be "Canadian content", and at least 50% of programming between 6:00pm and midnight be "Canadian content", where "Canadian content" is defined by the CRTC.

offerings. In 1999, Eastlink becomes the first cable company in Canada to offer telephone service, which signals the beginning of an era where cable companies bundle cable, phone, and internet services.[6]

Firm size, in terms of national subscribership, plays an important role in determining the pricing and channel bundling decisions of cable companies, that in turn determines the profitability of a cable operator for a given LSA. Various empirical studies of the U.S. cable television industry document the fact that large firms tend to realize lower per-subscriber costs for their channel offerings as a result of vertical integration with channel companies, or higher bargaining power that lowers large firms' negotiated per-subscriber channel cost.[7] Lower per-subscriber costs allow large companies to realize higher profits for a given cable package offering. Moreover, these cost differentials can affect firms' pricing and channel bundling decisions, which can further impact the relative profits that a large from can earn from a given LSA relative to that of a small firm.

These profit differentials give rise to acquisition behaviour in the cable industry, where large firms purchase small firms in order to gain access to new subscribers, and earn additional profits beyond the status quo.[8] In Canada, the CRTC recognizes this fact and formally defines its national policy with respect to acquisitions in Public Notice PB89-109. The CRTC decentralizes the buyout process, by allowing collections of cable operators to propose deals to the national regulator. These exchanges are not competitive (i.e. there is no bidding for licenses), and the CRTC is explicit in that it *does not* look for rival purchasers. The regulator evaluates transactions on a case-by-case basis, and puts the onus on the parties involved to show that a proposed merger "yields significant and unequivocal benefits to the communities served." The chief concern of the CRTC is that the basic cable rates do not rise following an acquisition. Firms are free to do as they wish in altering non-basic package prices and content. The predominant benefit put forth by purchasing companies is the fact that they can offer better cable service than the status quo without raising basic prices. Another often cited motive is local geographic scale economies (i.e. economies of

[6] See http://www.eastlink.ca/about/history/index.asp

[7] Chipty (1995), Ford and Jackson, (1997), Chipty and Snyder (1999), and Crawford and Yurukoglu (2009) all find evidence to support the fact that large cable companies are relatively more profitable than small ones.

[8] Various articles in media journals document consolidation for the U.S. cable industry. See Parsons (2003) for a historical overview.

density/agglomeration) can be realized from buyouts if the acquiring firm operates in LSAs that are geographically proximate to those of the selling cable companies. I provide examples of CRTC-documented decisions that involve improved channel offerings and economies of density in Figures 12 and 13 in the Appendix. In both examples, the buying company is increasing the number of channels offered locally. Figure 12 shows the buying company, Rogers, sinks \$380,000 in acquisition-related investments into technical services and capital costs. These sunk acquisition costs are common to many acquisitions.

1994 Deregulatory Policy

With Public Notice PB94-59 the CRTC alters its channel carriage restrictions by expanding the universe of non-basic channels that can be offered by cable companies. The regulator licenses 10 new channels, consisting of 2 English pay channels, 6 English speciality channels, and 2 French pay channels.[9] All of the new services are Canadian-based products, and their introduction represents the first major change in the universe of channel offerings since the late 1980's. The pay channels are offered as separate à la carte services by cable operators, while the specialty channels are primarily intended for the extended-basic tier. The policy change is a response by the CRTC to the emergence of DBS in the U.S. in 1994, which signals a (forthcoming) changing of the times for the cable television industry in Canada. The CRTC's primary objective is to ensure that there is additional Canadian presence in subscribers' non-basic channel packages, as the entry of DBS in Canada will at some point flood consumers' non-basic options with an array of internationally-based channels. None of these new services are vertically integrated with cable companies, implying that all cable operators face separate new channel adoption decisions.

3 Data

The data provides context and motivation for my modeling choices. I therefore discuss empirics before developing a model of acquisitions and entry for the cable television industry.

[9] These channels include 2 English pay channels (Movie Max and Classic Channel), 6 English specialty channels (YOU: Your Channel, Showcase, Bravo!, Lifestyle Television, Discovery, and The Country Network), and 2 French specialty channels (Le Réseau de l'information and Arts et Divertissement.)

3.1 Sources

The primary dataset is constructed using the CRTC Master Files for the 1990-1996 period.[10] They contain detailed information on firms' revenues, costs, and subscribership at the (LSA, year)-level of aggregation, and are broken down by basic and non-basic services. The information contained in these files is collected and verified by Statistics Canada on behalf of the CRTC through firms' submission of Annual Return of "Broadcasting Distribution Licensee" forms. I use a subset of the variables available including the number of subscribers, subscription revenue, channel counts, and affiliation payments made by cable companies to channel providers. I restrict my empirical analysis to 1990-1996, as information on non-basic subscriptions and revenues is not available prior to 1990. Furthermore, restricting my analysis to a period before 1998 allows me to abstract from modeling complications related to competition from DBS (below). I can also focus solely on profitability from cable services as firms do not bundle phone, internet and cable over this period. After removing these observations and dropping outliers, the resulting unbalanced panel from the Master Files consists of 4407 observations, over the 1990-1996 period, across 826 locations (out of 1262 total).

The second data source is the CRTC's Decision and Notices (DNO) archives. For each LSA, the CRTC maintains searchable archives online for all LSA-ownership related decisions from 1984 onwards.[11] Example decision files include new license applications, license renewals and revocations, as well as license buyouts among cable companies. Using these decision files, I track the current cable operator (if there is one) for all 1262 LSAs defined in the Master Files over the 1985-2004 period. For each acquisition, I record the acquisition date, the identity of the buying and selling firms, the LSAs involved, and the transaction price (where available). I also identify new entrant cable companies in the sample. Although the Master Files contain information on how licenses are allocated across firms in a given year, it is important for my empirical results that the exact timing of acquisition and entry decisions, as well as the firms and locations involved, be accurately recorded. Further, the information contained in the Decision and Notice files identifies the subsidiaries of large cable companies that differ by name from their parent company. The Master Files often fail to distinguish subsidiaries from their parent companies. Figures 12 and 13, referred to above, are

[10]Stephen Law provided these data. They have been previously used in Law (1999) and subsequent papers.

[11]The url for the Decisions and Notice archives is http://www.crtc.gc.ca/eng/dno.htm

examples of Decision Files for acquisitions.

I also collect information from the 1991 and 1996 Canadian Censuses on the total number of households, average household income, average household size, average age, the unemployment rate, educational attainment (fraction of population with post-secondary education), and urban density (population per square kilometre). These data are used to control for variation in LSA-level demand for cable below. LSA name identifiers are matched to their corresponding Census Subdivision or Dissemination Area to obtain the above Census aggregates at the LSA level. I use the 1996 Geosuite package from Statistics Canada to track location-specific household counts and urban density, as it provides a more accurate measure of the local population and urban density than what a location's Census Subsidivision yields. Moreover, Geosuite provides data for 1991 household counts and urban density, correcting for differences in Census boundaries between the 1991 and 1996 Censuses. For non-Census years, I follow Holmes (2008) and use a weighted average of the 1991 and 1996 data. Specifically, the census variable x_t for $t \in \{1992, \ldots, 1995\}$ is computed as $x_t = \left(\frac{1996-t}{1996-1991}\right)x_{1991} + \left(\frac{t-1991}{1996-1991}\right)x_{1996}$, and I set $x_{1990} = x_{1991}$. Geographic information on LSA latitudes and longitudes are obtained using location name searches from Google Maps.[12]

For my empirical analysis, I require a measure of a firm's national subscribership in a given year. This is simply the total number of subscribers across all LSAs that a cable company currently operates in. The total number of subscribers is relatively well-reported, as I have information on these figures for all 1262 LSAs in the Master Files. Using these data, and Census information on the total number of households in a given location, I interpolate missing years' subscribership data. This provides an estimate of market size for all locations over the 1990-1996 period, which allows me to compute a firm's national subscribership for every year.

3.2 Empirical Facts

Table 1 reports summary statistics at the LSA-level for the CRTC Master File data (top panel), and the matched Census data (bottom panel), for the 1990-1996 period. The table shows the

[12] I obtain the centre of a location by doing a name search for an LSA, and then use the script `javascript:void(prompt('',gApplication.getMap().getCenter()))`. Ideally, I would use geo-coded maps containing LSA boundaries to track the 'location' of LSAs in the sample, however in my discussions with the CRTC, it has become evident that no such maps exist.

Table 1: Local Service Area Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
CRTC Master Files				
Subscription Revenue	24.852	68.632	0.004	855.238
Affiliation Payments	3.045	9.722	0	157.162
Subscriber Count	9.730	26.755	0.010	297.268
Variable Profit per Subscriber	1.741	1.572	0.012	15.863
Census				
Average Household Income	39.232	9.350	6.251	88.098
Average Age of Population	46.203	4.059	29.560	59.766
Urband Density	4.481	6.950	0.010	67.291
Unemployment Rate	0.130	0.087	0.009	0.713
Share of Population with Post-Secondary Schooling	0.306	0.078	0.019	0.723

Notes: The number of observations is $N = 4407$. Subscription revenue and affiliation payments to channel providers for all cable services are reported in terms of one hundred thousand dollars per year. Subscriber count measured in thousands and variable profit per-subscriber is reported in hundreds of dollars per-subscriber per year. Urban density is measured in terms of one hunderd people per square kilometre. All nominal dollar amounts are adjusted to 1992 constant dollars using the seasonally-adjusted Canadian CPI, excluding indirect taxes, food and energy (Table 176-003, Statistics Canada).

number of subscribers across LSAs varies extensively. For example, the subscribership of the smallest LSA is less than one percent of the size of the largest LSA. The average sized LSA has 9730 subscribers, while the median (unreported) has 1505 subscribers, reflecting skewness in the subscribership distribution. Subscription revenue and affiliation payments to channel providers similarly vary extensively across markets. Variable profit per-subscriber (subscription revenue less upstream channel affiliation payments) on average is \$174 per year, or \$14.50 per month.[13] Per-subscriber profits also has substantial variation across LSAs, and over time, reflecting both variation in both LSA-level demographics, and differences in cable package offerings by firms.

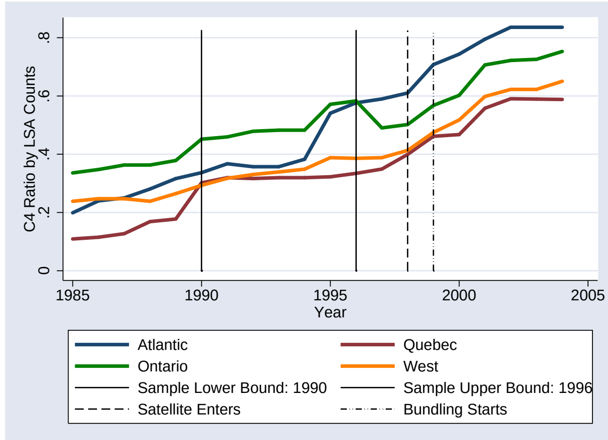
Figure 1 shows how LSA ownership concentration amongst cable companies evolves over the 1985-2004 period for 4 geographic regions in Canada.[14] The figure plots, by region, the share of LSAs owned by the 4 largest cable operators.[15] The regional plots depict a non-stationary trend in LSA ownership concentration. The increase across the regions is notable, with the largest rise

[13] All nominal amounts are in 1992 dollars throughout the paper.

[14] Atlantic Canada includes Newfoundland, Nova Scotia, Prince Edward Island, and New Brunswick. Western Canada includes Manitoba, Saskatchewan, Alberta, and British Columbia.

[15] Similar patterns are obtained if I compute these figures by subscribership rather than LSA counts.

Figure 1: Share of LSAs run by 4 Largest Firms



occurring in Atlantic Canada (rise from 20% to 80%), while Quebec realizes the smallest, yet considerable, LSA-ownership concentration growth (rise from 15% to 60%). Table 2 highlights the identity of the top 10 firms in terms of national subscribership in 1996, and their involvement in acquisitions. Out of the 674 cable companies that are active at some point over the 1985-2004 period, the top 10 firms account for over half of the 514 firm-level buyouts, and 70% of the 1428 LSA acquisitions. Generally speaking, these data reflect the emergence of dominant regional cable companies, and geographic clustering of LSA ownership over time.

Firm acquisition behaviour is fundamental to the rise in concentration of LSA ownership. Figures 2 and 3 illustrate how annual merger activity varies over the 1990-1997 period. Figure 2 shows the total number of LSA acquisitions by incumbents, and Figure 3 graphs the corresponding firm-level acquisitions. There are two clear spikes in acquisition activity in 1990 and 1995. The first does not correspond to a particular event, rather it is part of an initial sorting of firms to LSAs that follows the inception of the Regulations. The 1995 spike corresponds to the deregulatory policy, which is enacted in June of 1994, that expands the number of non-basic channels available to cable companies.

I investigate firms' relative profitability, and their response to the 1994 regulatory change with Figures 4-7. These figures plot the mean number of non-basic channels, revenue per-subscriber, affiliation payments per-subscriber and subscription profits across LSAs, and are broken down by

Table 2: Acquisitions by Large Companies

Buyer	Firm Acq. Count	LSA Acq. Count	Share of Subscribers	Primary Regions
Rogers	16	105	0.321	Ontario
Shaw	57	227	0.182	West
Videotron	26	87	0.143	Quebec
Cogeco	52	145	0.059	Quebec, Ontario
C.F. Cable	6	39	0.052	Quebec
Fundy	8	24	0.025	Atlantic
Persona	81	267	0.025	Atlantic, Ontario, West
Videon	8	54	0.019	West
Eastlink	19	58	0.017	Atlantic
Cable Atlantic	4	12	0.014	Atlantic
Top 10 Total	277	1018	0.852	
All Other Companies	240	413	0.148	
Total	514	1428	1	

Notes: Subscribership counts/shares are computed for 1996.

whether LSAs are operated by one of the 10 largest companies (by national subscribership in 1996) in a given year.[16] I refer to the top 10 firms as "large" firms, and all other firms outside of the top 10 as "small" firms. Figure 4 shows that large firms offer more non-basic channels on average than small firms, and that the 1994 policy change has an asymmetric impact on large and small firms' non-basic channel offerings. The average number of non-basic channels between 1994 and 1995 jumps (approximately) from 11 to 15 channels for large firms, while there is little movement in the average number of non-basic channels offered by small firms. Figures 5 and 6 highlight a drastic jump in per-subscriber revenue and channel costs for large companies, that goes unrealized by smaller operators from 1994 to 1995. These trends reflect the relative difference in non-basic channel adoption between large and small companies observed in Figure 4. Large companies pay more for additional channels, and pass these costs down to subscribers. Subscription revenue also rises if consumers switch from basic to non-basic cable as a result of the new non-basic channel offerings. Figure 7 shows that the revenue growth dominates the cost growth for large companies, leading to an asymmetric rise in average per-subscriber profitability between large and small companies following 1994. Between 1994 and 1996, the top 10 cable companies' average

[16]Similar figures are produced if I break down firms by the top 5 through top 30 largest companies.

Figure 2: LSA Buyout Counts

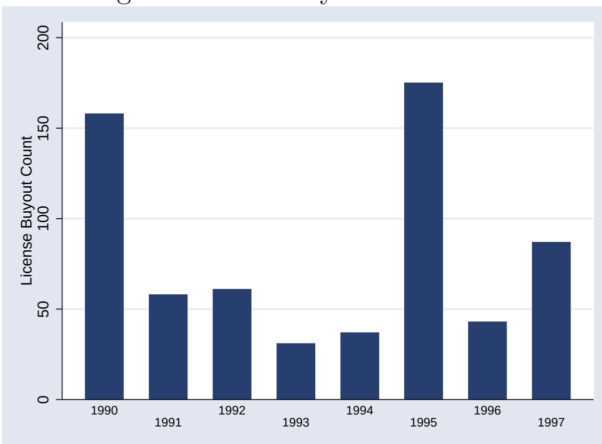
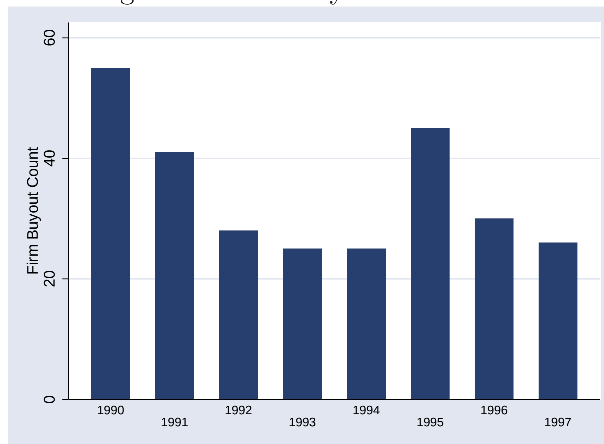


Figure 3: Firm Buyout Counts



annual per-subscriber subscription profit rises from \$99.79 to \$175.35, while such a rise is not realized by small cable operators' profits. Figure 7 also shows that prior 1994, small firms earn more profits per-subscriber than do large firms. These unconditional means do not control for the fact that large cable companies tend to be located in more urban centres, where subscribers have more alternatives to watching television relative to consumers in rural LSAs. This highlights the importance of controlling for LSA-specific observables and unobservables in estimating the impact that firm size has on profitability below.

4 Model

I develop a model for the cable television industry to evaluate the impact that subscribership-based scale economies, economies of density, and the 1994 regulatory change has on firms' profitability, acquisition, and entry decisions over the 1990-1996 period. The industry consists of $i = 1, \ldots, N_t$ cable companies, who are local monopolists across $\ell = 1, \ldots, L$ LSAs (locations), for $t = 0 \ldots T$ periods (years). I slightly abuse notation, and use N_t and L to represent the set of firms and locations as well.

Figure 4: Number of Non-Basic Channels

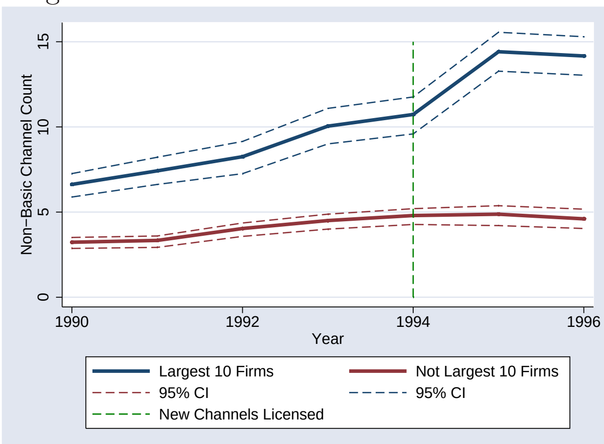


Figure 5: Revenue per Subscriber

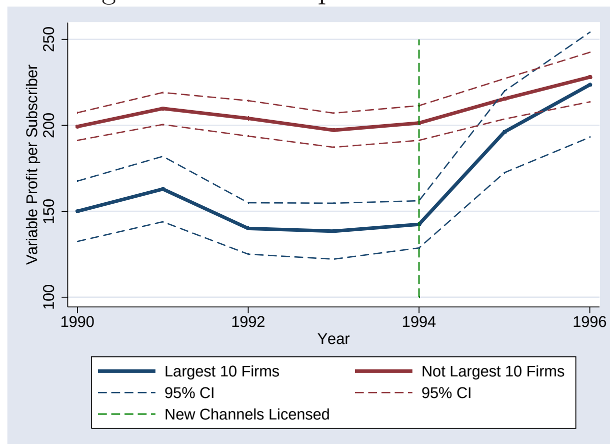


Figure 6: Affiliation Payments per Subsc.

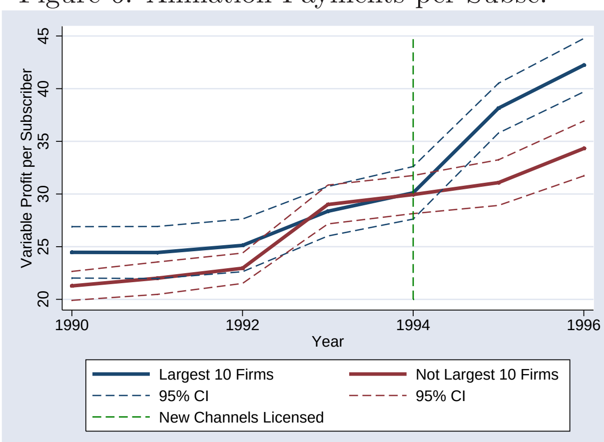
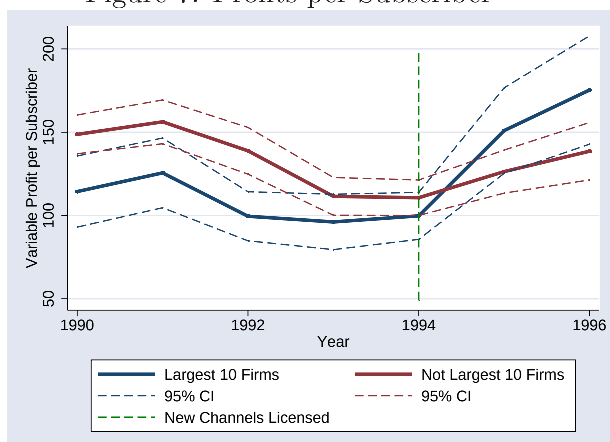


Figure 7: Profits per Subscriber



Within each period, cable companies myopically play a two subperiod merger game. In the first subperiod, firms interact in the acquisition and entry market, where incumbents simultaneously decide whether to merge, and entrants make entry decisions.[17] I model this process as a coalition-formation game as in Farrell and Scotchmer (1988).[18] Acquisitions are irreversible, which means

[17]I abstract from geographic expansions into new LSAs as there is insufficient new LSA entry activity over 1990-1996 to admit empirical modeling of this behaviour. I simply drop the LSAs that are expanded into by incumbents or entrants after 1989 in the estimation sample. Since these LSAs are located in rural, sparsely populated areas, they should have little impact on the measurement of economies of density and national subscribership.

[18]Recent research in the empirical political economy literature uses one-sided matching models in a spatial setting. Weese (2009) uses a one-sided coalition-formation framework to study political amalgamations in Japan. Gordon and Knight (2009) use a one-sided matching model to study school-district amalgamations. Both papers restrict their analyses to contiguous mergers, as non-contiguous amalgamations are not observed. The latter paper further abstracts from matches involving more than two districts as they rarely occur. I cannot make such abstractions since

selling firms cease to exist following a merger. Thus, the outcome of the merger game for a given period determines the set of firms that exist in the next period, implying that N_t evolves over time. Formally, the set of firms in period t is:

$$N_t = \begin{cases} 1 \dots N_0 & \text{if } t = 0 \\ \{i : \text{firm i still active in year t}\} & \text{if } t > 0 \end{cases}$$

Within a period, the set of LSAs firm i operates in potentially changes depending on whether it acquires other cable companies in the first subperiod. I denote L_{it} and $\tilde{L}_{it}$ as the set of LSAs owned by firm i within the first and second subperiods of period t, respectively. Given the outcomes from the acquisition game, firms earn profits from their LSAs in the second subperiod. In describing the model, I begin with the second subperiod as it is fundamental to the payoffs that govern play in the first subperiod.

The myopic decision-making assumption is strong, and warrants some discussion. If I allow firms to be forward-looking in their acquisition decisions, then I must compute the flow value of a match which takes into account all possible merger sequences for all firms in the future. As has been noted by previous authors who estimate strategic models of network formation, the computational burden of such a calculation is extreme, and one is forced to make assumptions to make the model tractable. The myopic decision assumption allows firms in my model to consider the rich choice set of all potential merger partners in the data, and further allows firms to consider the joint value of acquisitions of two or more firms, which previous papers abstract from.[19] Another modeling approach is to incorporate fully forward-looking decision making, but completely ignore strategic interaction by firms. This is the approach Holmes (2008) takes in studying the spread of Walmart in the U.S.. This is not an attractive alternative in my context as the Decision and Notice files clearly show that firms strategically interact when engaging in a merger. A second motive for this assumption is the fact that a collection of dominant firms grow in a highly non-stationary fashion

I often observe many non-contiguous acquisitions, as well as mergers involving 3 or 4 firms.

[19]That is, I do not have to make a local managers assumption (as in Aguirregabiria and Ho (2009)) whereby the collection of merger decisions are made independently when rms merge with multiple partners. There is ample evidence in the CRTC Decision and Notice files to suggest that firms account for the joint value of mergers with multiple partners when making acquisition decisions.

over time. Modeling the forward-looking behaviour of these firms would thus require that I develop and estimate a non-stationary game, an environment which to date lacks empirical methods.[20] Developing such methods is well beyond the scope of this paper.

4.1 Sub-Period 2: LSA Profits

Firms offer cable packages to subscribers within their LSAs, subject to the basic price and carriage restrictions imposed by the CRTC, which defines how much subscription profits per-subscriber a company earns from a given LSA.[21] As discussd, the composition, cost, and profitability of these bundles can vary depending on the national presence of a cable operator. Companies also incur fixed technical, administrative and service costs in offering services to their LSAs. The following profit function accounts for these factors, predicting firm i's profit from LSA ℓ at time t:

$$\pi_{i\ell t} = v_{i\ell t} \times Q_{\ell t} - F_{i\ell t} \tag{1}$$

where $v_{i\ell t}$ is the subscription profits per-subscriber, $Q_{\ell t}$ is the population of subscribers in location ℓ at time t, and $F_{i\ell t}$ is firm i's fixed cost of servicing LSA ℓ at time t. In Equation (1), I take the total subscribership of the market as exogeneously given.[22] Out of the total number of households in a given LSA, one might expect the number of households that sign up for cable (known as the penetration rate) to depend on the cable company who serves LSA ℓ at time t. However, in my preliminary empirical work I found virtually no relationship between the penetration rate and

[20] Current methods for estimating dynamic network-formation games using entry/exit models (such as those used by Aguirregabiria and Ho (2009) and others) require that entry/exit behaviour follow a stationary process. Ellickson et. al (2008) highlight this non-stationarity issue as well in motivating their use of a static game in estimating a strategic model of network formation in the U.S. retail industry.

[21] A complete industry model, like that of Crawford and Yurukoglu (2009), incorporates these optimal price and bundling decisions of cable companies. However, since data on channels' identity and prices for extended basic and specialty services are currently unavailable, I cannot explicity model how firms extract rents from their subscribers. See Chu (2008) and Crawford and Yurukoglu (2009) for structural approaches to modeling cable companies' bundling decisions in the U.S., where channel identities and bundle prices are available from the *Cable Television Factbook*. Microdata on channel offerings, market shares, and prices for extended basic and speciality services are availabe in Canada from a private marketing company called Mediastats for a price that is in excess of $10,000 per year.

[22] The tying requirement for non-basic and basic services implies that the total number of people signed up for basic services equals the total number of subscribers overall. To see why, suppose individuals' tastes for cable is heterogeneous such that people with strong preferences for cable get non-basic services, and low demand types get basic cable only (as in Chu (2008) or Crawford and Yurukoglu (2009)). With heterogenous tastes for cable, assuming the fraction of people that sign up for cable service in a population is exogenous is the same as saying the marginal consumer at the lower end of the cable willingness-to-pay-distribution is exogenous.

firm characteristics after controlling for local demographics.[23] I therefore adopt a parsimonious specification of the profit function that assumes the subscriber base is exogenous.

Within location ℓ at time t, firm i's subscription profits per-subscriber is defined as follows:

$$v_{i\ell t} = \sum_{dreg=0}^{1} \left[\beta_0^{dreg} + \beta_1^{dreg}\tilde{Q}_{it} + \beta_2^{dreg}\tilde{Q}_{it}^2 + X_{\ell t}\beta_3^{dreg}\right] + \beta_{4i} + \beta_{5\ell} + \beta_{6t} + \epsilon_{i\ell t} \tag{2}$$

where $\tilde{Q}_{it} = \sum_{\ell \in \tilde{L}_{it}} Q_{\ell t}$ is the national subscribership of firm i in the second subperiod of time t, and $X_{\ell t}$ are location-specifc profit shifters (for example, income). The dependent variable is calculated as total annual subscription revenue from basic and non-basic services, less affiliation payments made to upstream channel providers, divided by the total number of basic subscribers (which is equivalent to the total number of subscribers because of the tying of non-basic to basic services). The error term consists of four components: β_{4i} is firm i's individual effect, $\beta_{5\ell}$ is location ℓ's individual effect, β_{6t} is an aggregate time effect, and $\epsilon_{i\ell t}$ is an i.i.d idiosyncratic profit shock drawn from a normal distribution with mean 0 and variance Σ_ϵ. I include the square of national subscribership to allow for an increasing or decreasing effect of firm size on per-subscriber profitability. The superscripts for the first 4 coefficients allows firms' subscription profit function to change as a result of the 1994 deregulation. The values $dreg = 0$ and $dreg = 1$ respectively correspond to the periods before (1990-1994) and after (1995-1996) the policy change. The parameters of interest are β_1^{dreg} and β_2^{dreg} for $dreg \in \{0, 1\}$. They determine how firm size affects LSA profitability, and the extent to which the policy change affects the marginal effect of firm size on subscription profits.

Cable companies incur fixed administrative, technical, capital, and marketing expenditures to serve LSAs. As noted in many CRTC Decision Files, these costs can be spread across geographically proximate LSAs. I therefore adopt the following specification for the fixed cost firm i pays to serve

[23] Specifically, I estimate a tobit model, with LSA random-effects, that predicts the penetration rate as a function of the exogenous demand shifters used in this paper, firm fixed effects for the 15 largest firms, and the national subscribership of a cable operator i in LSA ℓ at time t. The estimated marginal effect (evaluated at sample means) that a 100,000 subscriber increase in national subscribership has on the penetration rate is less that 0.1%. Firm fixed effects also have negligible marginal effects as well. Part of the reason for this may be due to the fact that basic cable prices and channel offerings are highly regulated (unlike non-basic services), implying that for a given LSA, firms' flexibility over what channels and prices to offer in the basic package is limited. I have estimated the model in this paper treating Q_{it} as endogenous, and find the results are largely unchanged.

LSA ℓ at time t:

$$F_{i\ell t} = fc_0 + fc_1 W_{\ell t} + fc_2 EOD_{i\ell t} + fc_{3i} + fc_{4\ell} + fc_{5t} + \omega_{i\ell t} \tag{3}$$

where $W_{\ell t}$ are local cost shifters, $EOD_{i\ell t}$ is the economies of density realized by firm i in location ℓ at time t, $(fc_{3i}, fc_{4\ell}, fc_{5t})$ are respectively firm, location and time-specific fixed cost effects, and $\omega_{i\ell t}$ is an i.i.d idiosyncratic fixed cost shock drawn from a mean-zero distribution. Economies of density depends on how densely clustered firm i's LSAs are located around LSA ℓ. I adopt a measure that is similar to that used by Jia (2008): $EOD_{i\ell t} = \sum_{\ell \in L_{it}} \sum_{\ell' \in L_{it}, \ell' \neq \ell} \frac{1}{2d_{\ell\ell'}}$ where $d_{\ell\ell'}$ is the distance from the centers of LSAs ℓ and ℓ'. To ensure consistency in estimation, the geographic effect of local LSA ownership on fixed costs must die away at a sufficient rate as the distance between two LSAs increases. I therefore set $d_{\ell\ell'} = \infty$ for $d_{\ell\ell'} > \bar{D} = 100$ kilometres.[24]

4.2 Sub-Period 1: Acquisition Game

In the first subperiod of period t, the acquisition and entry game is played by the set of N_t active cable companies. It is a simultaneous-move, full information, co-operative game, where firms are free to merge with other collections of firms.[25] A merger at time t, S_t, consists of a subset of active firms: $S_t \subset N_t$. A merger structure Π_t is a partition of N_t into K mergers: $\Pi_t = \{S_1 \dots S_K\}$, $S_i \bigcap S_j = \emptyset$ for $i \neq j$.

For a given merger, I index the acquiring cable company with $\mathbf{i}$. It is defined as the largest cable company by national subscribership in the first subperiod: $\mathbf{i} = \{i : i \in S_t, Q_{it} = \max_{i \in S_t} Q_{it}\}$, where $Q_{it} = \sum_{\ell \in L_{it}} Q_{\ell t}$ is the national subscribership of firm i in the first subperiod of period t. This assumption is consistent with the fact that the largest firm is the buyer in over 95% of all mergers. Buyer $\mathbf{i}$ acquires the remaining $N_{S_t} - 1$ firms, and their corresponding LSAs. The set of LSAs owned by all of the firms in merger S_t as $L_{S_t} = \bigcup_{i \in S_t} L_{it}$, and the total number of subscribers across these LSAs is $Q_{S_t} = \sum_{\ell \in L_{S_t}} Q_{\ell t}$.

The definition of the buyer matters for two reasons. First, the sellers' firm-fixed effects in the

[24] I have checked my estimation results for $\bar{D} = 75$ and $\bar{D} = 150$ kilometres, and find little difference in my estimates.

[25] Note that the game is played at the firm level, not the LSA-level. I abstract from the possibility that firms sell subsets of their LSAs to other firms, an event that I rarely observe in the data.

per-subscriber profits functions are replaced by the individual effect of the buyer, which affects the surplus generated by an acquisition. Second, in forward-simulating merger activity for the industry below, I must track the buyers year-to-year as the outcome of the acquisition game in period t determines the allocation of LSAs to firms as well as the set of remaining cable companies at the beginning of period $t+1$.

Acquisition Payoffs and Costs

The total value firm i creates from its L_{it} LSAs in period t is simply the expected sum of their individual values:

$$V_{it} = \sum_{\ell \in L_{it}} E[\pi_{i\ell t}] \tag{4}$$

where the expectation operator is over $\epsilon_{i\ell t}$ and $\omega_{i\ell t}$, which I assume are drawn after the acquisition and entry game is played. For merger S_t, the total value is similarly defined as the sum of the value of the LSAs owned by the firms in S_t:

$$V_{S_t} = \sum_{\ell \in L_{S_t}} E[\pi_{\mathbf{i}\ell t}] \tag{5}$$

Acquisitions are costly, as they typically involve large sunk investments by buying companies related to technical upgrades of newly purchased cable systems, or initial marketing expenses and distribution costs to promote new cable offerings to subscribers. As discussed in Section 2 and highlighted in Figure 12, these sunk expenditures are often in the range of hundreds of thousands of dollars. I define acquisitions costs as follows:

$$AC_{S_t} = ac_0 + ac_1 Q_{S_t \setminus \mathbf{i}} \tag{6}$$

where $Q_{S_t \setminus \mathbf{i}} = Q_{S_t} - Q_{\mathbf{i}t}$ is the total number of subscribers in the LSAs of the firms acquired by buyer $\mathbf{i}$. Acquisition costs will also capture any regulatory costs that are involved with mergers.

Entry

In the data, I observe new cable companies who enter the industry by acquiring the LSAs of incumbent firms. To account for entry in period t, I assume that there is one entrant for each incumbent. Each entrant can only enter the industry through a bilateral acquisition, where it acquires its corresponding incumbent cable company. The number (and set) of firms in the period t acquisition game is thus $N_t = 2\tilde{N}_t$, where $\tilde{N}_t$ is the number of incumbent firms. This entry process is largely consistent with my readings of the CRTC Decision and Notice Files. In the estimation sample, there are no instances where an entrant acquires two or more incumbents, and entrants typically acquire small incumbent cable companies.

Prior to entry, an entrant draws an individual variable profit shock β_{4i}, and must sink a one-time entry cost EC_{S_t} defined as:

$$EC_{S_t} = ec_0 + ec_1 Q_{it} \tag{7}$$

Entry costs are higher for entrants who acquire incumbents with larger national subscribership. This captures initial marketing and set-up expenses that scale with the size of a purchased incumbent cable company. These costs also capture any regulatory costs, or one-time technical upgrade expenditures that entrants sink upon acquiring an incumbent. I normalize entrants' reservation value to not entering to zero.

Acquisition Surplus

The surplus generated by merger S_t is the difference between what firms earn from their LSAs jointly less the sum of what they earn apart, net acquisition or entry costs (depending on whether the acquiring company is an entrant or incumbent):

$$\Delta V_{S_t} = V_{S_t} - \sum_{i=1}^{N_{S_t}} V_{S_t^i} - (1 - \mathbf{1}\{\text{new}_{\mathbf{i}t}\}) AC_{S_t} - \mathbf{1}\{\text{new}_{\mathbf{i}t}\} EC_{S_t} + \varepsilon_{S_t} \tag{8}$$

The indicator function $\mathbf{1}\{\text{new}_{\mathbf{i}t}\}$ equals 1 if the buying firm is an entrant. The final term ε_{S_t} is an i.i.d merger-specific shock drawn from a mean-0 Type-1 Extreme Value distribution with scale parameter σ_ε. The shock captures any acquisition synergies that are observed by the firms but not the econometrician. Beyond this shock, acquisition surplus depends on the relative size of buyers and sellers (which affects variable profits), economies of density if buyers and sellers own nearby LSAs (which affects total fixed costs paid across LSAs), and differences in firm-specific variable profit or fixed cost effects (i.e.: β_{4i} and fc_{3i}). Location and time-specific effects in fixed costs and variable profits ($\beta_{5\ell}, \beta_{6t}, fc_{4\ell}, fc_{5t}$) difference out in Equation (8), implying that they do not affect the model's predictions over what mergers occur. Should a firm not enter a merger with another company, it earns a merger surplus of zero.

Like Farrell and Scotchmer (1988), I make the simplifying assumption that firms equally split merger surplus. Under an equal-sharing assumption, the total expected payoff to firm i from merger S_t is:

$$V_{S_t[i]} = V_{it} + \frac{\Delta V_{S_t}}{N_{S_t}} \tag{9}$$

This assumption rules out the possibility of transfers between firms, that would endogenize how acquisition surplus is split. For example, I do not allow for the possibility that a weaker firm could entice a stronger firm to form a merger by offering a large share of the merger surplus. If I were to allow for endogeneous transfers of merger surplus, multiple equilibria would arise, implying that there would be a non-unique mapping from the model to the data. For my estimation algorithm below, this implies that for a given parameter vector, I would have to find *all* equilibria in the acquisition game, which is computationally prohibitive. Like various other papers that build structural sorting models, I do not check robustness of my empirical findings with respect to this assumption, as such an exercise represents a challenging research frontier.[26]

Across mergers, only the acquisition surplus varies, and it is therefore what defines firms' preferences over mergers. Thus, I characterize the equilibrium and estimation strategy in terms of acquisition surplus. Notice that under the equal sharing assumption, firms' preferences are *symmetric* for a given acquisition, as all merging companies earn the same value from their merger.

[26] See for example Sorensen (2007), Park (2008), Gordon and Knight (2009) for examples of two- and one-sided matching papers requiring a fixed sharing assumption. Fox (2009) presents an alternative estimation strategy that is robust to endogenous transfers. He develops a maximum score estimator for 2-sided, one-to-one or many-to-many matching models, with binding quotas in the latter case.

Equilibrium

The equilibrium concept is the *stability* of merger structure Π_t. The intuition is that for a given Π_t, no group of buyers and sellers can coordinate to create a blocking merger $\tilde{S}_t \notin \Pi_t$ that yields higher surplus to all of the coordinating buyers and sellers relative to what they realize under Π_t. Formally, the definition is:

> Π_t is a *stable merger structure* if and only if $\nexists\ \tilde{S}_t \notin \Pi_t$ such that $\forall\ i \in \tilde{S}_t$, $\Delta V_{\tilde{S}_t} > \Delta V_{S_t[i]}$, where $S_t \in \Pi_t$.

Under the payoff structure from the acquisition game, firms' preferences over mergers are strict (i.e. each firm can uniquely rank their payoffs from coalitions) and symmetric. Under these conditions on preferences, Farrell and Scotchmer (1988) prove that a stable Π_t *exists* and is *unique*.[27] They provide an iterative "top-down" algorithm that produces the unique merger structure. Denote $\mathbf{S}_t$ as the set of all possible mergers at time t. Starting from iteration $k = 0$, the procedure for finding the unique stable Π_t is as follows:

1. Initialize $\Pi_t^0 = \{\emptyset\}$ and the remaining merger structure vector $\mathbf{S}_t^0 = \mathbf{S}_t$.
2. Compute ΔV_{S_t} for all $S_t \in \mathbf{S}_t^0$
3. Find $S_{\max}^k = \max_{S_t \in \mathbf{S}_t^k} \Delta V_{S_t}$
4. Update $\Pi_t^{k+1} = \Pi_t^k \cup S_{\max}^k$, $\mathbf{S}_t^{k+1} = \{S_t | S_t \in \mathbf{S}_t^k : S_t \cap S_{\max}^k = \emptyset\}$
5. Go back to Step 3 if $\mathbf{S}_t^{k+1} \neq \emptyset$, otherwise stop.

This algorithm is particularly useful for conducting counterfactual experiments below.

5 Empirical Implementation

My objective is to estimate the parameters in Equations (2) and (8). Collecting the parameters of the model, define $\theta_1 = \{\beta, \Sigma_\epsilon\}$, $\theta_2 = \{fc_2, ac_0, ac_1, ec_0, ec_1, \sigma_\varepsilon\}$, and $\theta = \{\theta_1, \theta_2\}$.[28] The model

[27] Similar results related to existence and uniqueness of an equilibrium have recently have been shown for one and two-sided matching games by Rodrigues-Neto (2007) and Sorensen (2005). Similar "top-down" algorithms for finding the unique equilibrium are also provided in these papers.

[28] Notice that I do not estimate fc_0, fc_1 and Σ_ω (the covariance matrix of the fixed cost shocks) in Equation (3). The terms corresponding to fc_0 and fc_1 difference out when I compute ΔV_{S_t}. They do not affect merger outcomes, and are therefore are not identified by the model. I also ignore firm-specific effects in fixed costs (fc_{3i}), as incorporating a vector of firm-specific fixed effects drastically increases the computational burden of estimation in the second step.

is estimated in two steps to reduce computational burden. First, I estimate the parameters of the variable profit (θ_1) using the LSA-level CRTC Master File data, and the matched Census data. The remaining parameters (θ_2) are then estimated using variation in buyout and entry decisions, the geographic location of buyers and sellers, and predictions for LSA-level variable profits from the estimated variable profit function.

I estimate Equation (2) as a multi-level mixed effects model that includes LSA fixed effects, and firm random effects.[29] This introduces another parameter into θ_1, σ_{β_4}, the variance of the mean-zero i.i.d normal firm-specific profit shocks. The vector of profit shifters in Equation (2) includes per capita income, per capita income squared, age, age squared, urban density, the unemployment rate, and the proportion of the population with post-secondary education. I include a quadratic trend in all specifications to control for yearly trends in per-subscriber profitability.

The remaining parameters in θ_2 are estimated by Simulated Maximum Likelihood. Given the data, the first-step parameter estimates ($\hat{\theta}_1$), a given β_4 draw (i.e. the vector of firm-specific profit shocks), and a value for θ_2, the likelihood that the observed merger structure in period t in the data corresponds to a stable Π_t is

$$\ell(\Pi_t \text{ stable } |\theta_2, \beta_4) = \int_{\varepsilon} \mathbf{1}\{\Pi_t \text{ stable } |\theta_2, \beta_4\} = \int_{\varepsilon_{\Pi_t}} P(\Pi_t \text{ stable } |\theta_2, \varepsilon_{\Pi_t}, \beta_4) \tag{10}$$

where ε and ε_{Π_t} are vectors of ε_{S_t} shocks for all possible S_t's, and for all $S_t \in \Pi_t$ respectively. The expression $\mathbf{1}\{\cdot\}$ is an indicator function equalling one if the argument is true. Conditional on a given ε_{Π_t} and β_4 draw, the probability that Π_t is stable can be computed as a product of probabilities:

$$P(\Pi_t \text{ stable } |\theta_2, \varepsilon_{\Pi_t}, \beta_4) = \prod_{S'_t \in \mathbf{S}'_t} P\Big(\frac{\Delta V_{S'_t}}{N_{S'_t}} < \max_{S_t \in \mathbf{D}_{S'_t}} \Big\{\frac{\Delta V_{S_t}}{N_{S_t}}\Big\} | \; \theta_2, \varepsilon_{\Pi_t}, \beta_4\Big) \tag{11}$$

where $\mathbf{S}'_t = \{S'_t | S'_t \notin \Pi_t\}$ is the set of all mergers not in Π_t, and $\mathbf{D}_{S'_t} = \{S_t | S_t \in \Pi_t, S_t \cap S'_t \neq \{\emptyset\}\}$ is the set of *deviating* firms from Π_t needed to form alternative merger $S'_t \notin \Pi_t$. This simple

[29] I do not include a full array of firm fixed effects as this leads to an incidental parameter problem. I have experimented with specifications that involve multiple firm-specific intercepts for larger companies in the sample and find virtually no difference in the results.

calculation follows from the assumption that the merger-specific shocks are i.i.d. across mergers.

Likelihood

To simulate the likelihood function of the model, I must evaluate acquisition surplus for all possible mergers in the sample.[30] The number of mergers increases exponentially in the number of firms, which can make computation of Equation (10) infeasible.[31] To reduce the dimensionality of the problem, I first break up the country into $m = 1 \ldots M$ geographic regions, across which firms play acquisition games independently. For national cable operators such as Shaw or Rogers, this implies that their regional subsidiaries do not consider the impact of their mergers in other regions when playing the acquisition game. For estimation, I define 10 geographic regions based on the Statistics Canada Census economic regions for 2001. Their definitions can be found in Table 7 in the Appendix.[32] Given these M independent regions, and the assumption that cable companies play the acquisition game independently across years, the likelihood function for the model is:

$$L = \int_{\beta_4} \Big\{ \prod_{t=1990}^{1996} \prod_{m=1}^{10} \ell(\Pi_{mt} \text{ stable } |\theta_2, \beta_4) \Big\} dG(\beta_4; \hat{\sigma}_{\beta_4}) \tag{12}$$

where Π_{mt} denotes the merger structure in region m at period t, G is the CDF for the β_4, and $\hat{\sigma}_{\beta_4}$ is the estimated variance of the firm-specific profit shocks from the first step. Since Equation (12) cannot be computed analytically, so for estimation I use simulation methods to approximate the log-likelihood:

$$\widehat{LL} = \sum_{m=1}^{10} \log \Big(\frac{1}{B} \sum_{b=1}^{B} \prod_{t=1990}^{1996} \Big[\frac{1}{K} \sum_{k=1}^{K} P(\Pi_{mt} \text{ stable } |\theta_2, \varepsilon^k_{\Pi_{mt}}, \beta^b_{4m}) \Big] \Big) \tag{13}$$

where β_{4m} is a vector of region m's firm-specific profit shocks, B and K are the number of simulation draws for $\beta_{4,m}$ and $\varepsilon_{\Pi_{mt}}$, and β^b_{4m} and $\varepsilon^k_{\Pi_{mt}}$ are the b^{th} and k^{th} draws. Recall the elements of β_4 are

[30] More specifically, I simulate acquisition surplus for all observed mergers, and evaluate merger surplus without any merger-specific shocks for all unobserved acquisitions.

[31] In a merger game involving N incumbent firms, the number of mergers is the sum of the binomial coefficients from zero to N: $\#S_t = \sum_{k=0}^{N} \binom{N}{k}$. So for example, a merger game involving 25 incumbents has over 1 billion possible mergers

[32] I drop the provinces of Newfoundland and Prince Edward Island as acquisition activity in these provinces is minimal over the 1990-1996 period.

i.i.d draws from a mean-zero normal distribution (whose variance is estimated in the first step), and $\varepsilon_{\Pi_{mt}}$'s elements are i.i.d draws from a Type-1 Extreme Value distribution. For companies located in multiple regions, I draw a firm-specific shock in each region.

Reducing Dimensionality

Within each geographic region and year, I further reduce the number of mergers in three ways. First, I follow Weese (2009) and restrict the maximum merger size to be the largest merger observed within a region in a given year. Second, I restrict the number of firms playing the acquisition game within a year and region to include the observed buyers and sellers in the data, and a random subset of firms who are inactive in the acquisition/entry market (i.e. firms who are not buyers or sellers in a given region and year in the data). This follows an approach taken by Park (2008), and reflects the fact that I do not have natural contiguity restrictions for acquisitions (i.e. firms only consider mergers amongst firms with neighboring LSAs) as in Weese (2009) and Gordon and Knight (2009), that helps reduce the number of merger surplus values to check in estimation. Even if a small cable company does not have contiguous LSAs or does not yield economies of density with a large firm through an acquisition, the larger company may have an incentive to acquire small ones because of a scale effect on variable profits. For given region, year and β_{4m} vector, I take a 20% random sample of inactive firms for each of the K $\varepsilon_{\Pi_{mt}}$ draws. I find minimal differences in the second-step estimates if I alternatively take 10% or 30% random samples. Finally, I drop those mergers whose minimum distance between buyers' and sellers' LSAs is larger than the maximum distance between merging firms LSAs in the data. I also drop acquisitions whose acquiring firm has less than the minimum of 2500 national subscribers and the minimum national subscribership of an acquiring firm within its region and year in the data.

6 Findings

This section presents my parameter estimates for the variable profit, fixed cost and entry cost functions. I then use the estimated model to perform counterfactual experiments that isolate the impact that economies of scale, density, and the 1994 policy change have on merger activity.

6.1 Parameter Estimates

The parameter estimates for the variable profit function are listed in Table 3. To highlight the importance of accounting for LSA fixed effects, I present OLS estimates as well. A comparison of the two sets of estimates shows that controlling for LSA unobserved heterogeneity is important. Particularly for the parameters of interest, the OLS estimates yield mixed, statistically insignificant estimates for the national subscribership coefficient for the pre and post 1994 period. There are odd findings for the demand shifters as well. For example, the estimates imply that age and income have a negative impact on per-subscriber profitability, which contradicts previous empirical findings on cable demand and household characteristics (see for example Crawford and Shum (2007)).

After controlling for LSA individual effects, I obtain much more plausible results for both the parameters of interest, and the marginal effects for the demographic variables. National subscribership has a statistically significant, positive impact on per-subscriber profits, and the marginal effect declines as national subscribership rises. All of the demand shifters have their expected signs, with age, urban density and education having statistically significant coefficients at the 1% level. The negative impact of urban density relates to the fact that households in rural areas have less alternatives to watching television in their leisure time than do households in urban centers. Income, age, and educational attainment all have a positive impact on profitability, however the estimated marginal effect of income is not as precisely estimated as the effects of age and education.

Focusing on the parameters of interest, national subscribership has a higher marginal effect that is diminishing at a more rapid rate in the years following the policy change. Testing the individual hypotheses that $\beta_1^{dreg=0} = \beta_1^{dreg=1}$ and $\beta_2^{dreg=0} = \beta_2^{dreg=1}$ yields P-values of $P = 0.187$ and $P = 0.127$ respectively.[33] Although these differences not are statistically significant at standard levels, their difference in magnitude has a large impact on firms' merger incentives, as shown in the counterfactual experiments below. Interpreting the coefficients, an increase in national subscribership by a cable operator of 100,000 subscribers raises annual variable profits per-subscriber by \$22.20 and \$25.90 for the two periods respectively. In monthly terms, these values are \$1.85 and \$2.16. This jump in national subscribership for an LSA is not uncommon, given the pattern

[33] A joint test of the equality of the two parameters also fails to rejects the null ($P = 0.301$), as does a joint test of the equality of all coefficients between the 1990-1994 and 1995-1996 periods.

Table 3: Variable Profit Parameter Estimates

	OLS		Fixed Effects	
	$dreg$=0	$dreg$=1	$dreg$=0	$dreg$=1
Q_{it}	-0.051	0.035	0.230***	0.269***
	(0.043)	(0.032)	(0.029)	(0.038)
Q_{it}^2	-0.000	-0.005***	-0.008***	-0.010***
	(0.001)	(0.002)	(0.001)	(0.002)
INC	-0.352***	-0.070	0.419*	0.375*
	(0.133)	(0.265)	(0.255)	(0.212)
INC^2	0.022	-0.065	-0.057	-0.014
	(0.014)	(0.041)	(0.039)	(0.025)
AGE	-0.535***	-0.574	0.893***	0.868***
	(0.083)	(0.348)	(0.348)	(0.090)
AGE^2	0.005***	0.006	-0.009***	-0.009***
	(0.001)	(0.004)	(0.004)	(0.001)
URB	-0.163***	-0.105	-2.478***	-2.449***
	(0.038)	(0.941)	(0.949)	(0.095)
$UNEMP$	1.863***	1.840*	-0.173	-0.103
	(0.334)	(1.087)	(1.059)	(0.945)
$EDUC$	-0.156	-0.587	2.652***	2.640***
	(0.417)	(1.221)	(0.797)	(0.788)
Constant	18.808***	5.149***	-	-
	(1.958)	(0.464)	-	-
σ_{β_4}	-		0.258	
R^2	0.115		-	
LL	-7968.281		-7467.933	
N	4407		4407	

Notes: Standard errors are reported in parentheses, and are clustered at the LSA level. ***,**,* denotes statistical significance at the 1%, 5%, and 10% level, respectively. Dependent variable is the difference between subscription revenue and channel affiliation payments per-subscriber ($v_{i\ell t}$), measured in hundreds of dollars per year. Q_{it} is the sum of all subscribers across all LSAs for cable company i in year t. The $dreg = 0$ columns correspond to the parameter estimates over the 1990-1994 period, and the $dreg = 1$ estimates are for 1995-1996. INC is average employment income of individuals, AGE is average age of the population, URB urban density measured as one hundred people per square kilometre, $UNEMP$ is the unemployment rate, and $EDUC$ is the proportion of individuals with post-secondary education. Both specifications include a linear and quadratic trend term.

of large firms purchasing small firms in the data.

An example of a hypothetical acquisition helps shed light on what the per-subscriber profit function estimates imply for the acquisition game. Consider a potential merger in 1994 involving two cable companies in the Southwestern British Columbia region, Reliance Distributors and Shaw Cablesystems. Reliance serves the LSA for Squamish, British Columbia, which has 4,415 subscribers. Shaw, the dominant cable company in Western Canada, has 1,171,214 subscribers nationally, many of which reside in nearby LSAs around Vancouver. Ignoring any agglomeration or firm-specific effects on profits, the parameter estimates for the pre-1994 period imply that Shaw can earn \$664,249 additional subscription profits due to the scale effect on profits if it takes over Reliance's LSAs. If the exact same acquisition scenario presents itself after the deregulation in 1995, the estimated model predicts that Shaw would generate \$747,240 dollars of subscriber-based surplus. This \$82,990 rise in surplus due to the policy change implies that the acquisition is feasible for a larger region of the support of the merger-specific shocks in 1995 than it is for 1994.[34] This is the sense in which the deregulation stimulates merger activity in the model.

The second stage estimates for the merger and entry cost functions are found in Table 4. Evaluating these functions at the mean values of LSA-subscribership and economies of density between two firms in the data, I obtain predicted acquisition and entry costs of \$631,669, and \$383,943. These values are respectively 28.6% and 17.6% of the mean subscription profit level for an LSA (\$2,180,659). These predictions reflect the large sunk costs related to capital upgrades and new equipment that acquiring/entering firms spend prior to entering new locations as alluded to in Section 2 above. Interpreting the coefficients, an additional subscriber amongst a set of acquired LSAs raises acquisition and entry costs by \$32.20 and \$22.12 dollars respectively. Economies of density has a modest effect on acquisition surplus. Consider for example a merger between two firms who own one LSA apiece. Suppose the distance between the two LSAs is $75 < \bar{D}$ kilometres. If the distance between the two LSAs falls by 50 kilometres, then merger cost falls by \$2,731.41, or 0.43% of the mean acquisition cost. This indicates that firms are limited in their ability to spread their fixed costs of operation locally.

6.2 Economies of Scale, Density, Deregulation and Acquisition Activity

In this section I use simulations to see how well the estimated model predicts acquisition and entry activity, and to isolate the separate impacts that economies of scale, density and the policy

[34]That is, the merger yields positive surplus over a larger region of the support in 1995 than in 1994. The change in the likelihood of the merger is ambiguous as it depends on the relative growth of the other merger opportunities for Reliance and Shaw.

Table 4: Fixed, Acquisition and Entry Cost Parameter Estimates

Variable	Estimate
fc_2	-1.023***
	(0.055)
ac_0	3.713***
	(0.004)
ac_1	0.322***
	(0.087)
ec_0	2.050***
	(0.074)
ec_1	0.221***
	(0.002)
$\widehat{AC}_{S_t}$ (mean AC)	6.317
$\widehat{EC}_{S_t}$ (mean EC)	3.839
σ_ε	1.886
LL	-41447

Notes: Standard errors are reported in parentheses. They correspond to outer-product-of-the-gradient (or OPG) estimates using numerical derivatives of the log-likelihood function. This assumes the first-stage profit function estimates are computed without error. Bootstrap standard errors, that incorporate sampling variability from the first step of the estimation procedure, will be computed in future versions of the paper. ***,**,* denotes statistical significance at the 1%, 5%, and 10% level, respectively. The coefficients ac_0 and ec_0 are in terms of hundred of thousands of dollars, and mc_1 and ec_1 are measured in terms of hundreds of dollars per-subscriber. The economies of density parameter, fc_2 is in terms of hundred of thousands of dollars. The mean values for an LSAs subscribership and economies of density between two firms is 8086 subscribers and 0.0784 respectively. The mean subscription level includes the interpolated data, which the merger and entry cost parameters are estimated on. All nominal dollar amounts are adjusted to 1992 constant dollars using the seasonally-adjusted Canadian CPI, excluding indirect taxes, food and energy (Table 176-003, Statistics Canada).

change have on merger behaviour. All results are reported in Table 5, and I provide graphical representations with Figures 9-11 to help ease comparison across the experiments.

For a given parameter vector θ, I simulate data with the model as follows:

1. Start in year $t = 1990$. For each region, draw firm-specific variable profit random effects β_{4m} for all initial incumbents using the estimated random effects variance from the first step, $\hat{\sigma}_{\beta_4}$.
2. For each possible merger, draw an $\varepsilon_{S_{mt}}$ merger-specific shock. Draw a β_4 for all potential entrants using $\hat{\sigma}_{\beta_4}$.
3. Compute merger surplus values for all possible mergers using Equation (8).
4. Find the unique stable merger structure by the iterative approach provided by Farrell and Scotchmer (1988) for each of the M regions.
5. Update the LSA-ownership distribution for each region. Compute the new national sub-

Table 5: Counterfactual Experiments Predictions

Year	Observed		Predicted		Experiment 1		Experiment 2		Experiment 3	
	Entry	Acq.	Entry	Acq.	Entry	Acq.	Entry	Acq.	Entry	Acq.
1990	32.00	11.00	31.80	19.09	21.71	20.23	27.17	19.23	31.80	19.09
1991	22.00	19.00	23.00	19.86	15.43	19.94	21.23	20.29	23.00	19.86
1992	14.00	17.00	13.91	15.54	8.23	16.43	13.40	16.20	13.91	15.54
1993	12.00	13.00	11.63	12.74	6.63	12.74	10.91	12.51	11.63	12.74
1994	10.00	11.00	12.71	10.94	6.86	11.69	11.80	11.83	12.71	10.94
1995	24.00	11.00	22.57	11.94	9.17	12.71	21.09	12.17	8.06	12.29
1996	15.00	9.00	15.17	6.11	6.34	6.20	14.40	7.26	7.23	6.40

Notes: "Entry" and "Acq." correspond to average entry and acquisition counts obtained from 500 forward simulations of the model. The column header definitions are as follows:
Predicted: Parameter estimates from the 2-step estimation procedure
Experiment 1: No economies of scale effects on variable profits: $\beta_1^0 = \beta_2^0 = \beta_1^1 = \beta_2^1 = 0$
Experiment 2: No economies of density effects on acquisition costs: $fc_2 = 0$
Experiment 3: No deregulatory effect on the variable profit function: $\beta^{dreg=1} = \beta^{dreg=0}$

scribership for all remaining firms.

6. Stop if the year is 1996, otherwise move to year $t+1$ and go back to Step 2.

All predictions correspond to mean acquisition and entry levels for 500 simulated sequences. I first forward-simulate sequences of acquisition/entry outcomes using my parameter estimates. The first two pairs of columns in Table 5 and Figure 8 shows that the model predicts acquisition and entry levels well, including the rise in acquisition levels following the policy change.

The remaining 3 pairs of columns in Table 5 and Figures 9-11 present results for 3 counterfactual experiments. The first counterfactual removes the impact of economies of scale on variable profits by setting $\beta_1^{dreg=0} = \beta_1^{dreg=1} = \beta_2^{dreg=0} = \beta_2^{dreg=1} = 0$. Figure 9 shows a stark decline in acquisition rates, with no spike in acquisitions in 1995, since the channel through which the deregulation affects firms' relative profits is shut down. Overall, acquisition levels fall by 42%, falling as much as 62% in 1995. Thus, the scale effect on firms' subscription profits plays a major role in firms' acquisition decisions, and is fundamental to the process whereby large cable companies buy out small ones in the industry over time. Local entry rises in the absence of scale effects, as fewer incumbent mergers leads to smaller incumbent cable companies, which lowers entry costs.

The second experiment removes the effect economies of density have on fixed costs by setting $fc_2 = 0$. The results for this counterfactual are listed in the fourth pair of columns in Table 5, and

Figure 8: Baseline Simulations

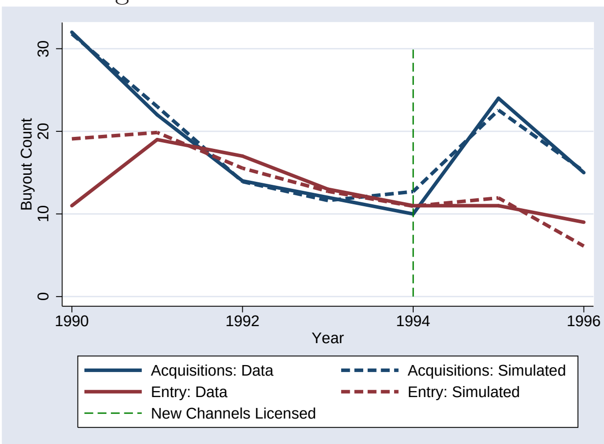


Figure 9: No Scale Effect on Profits

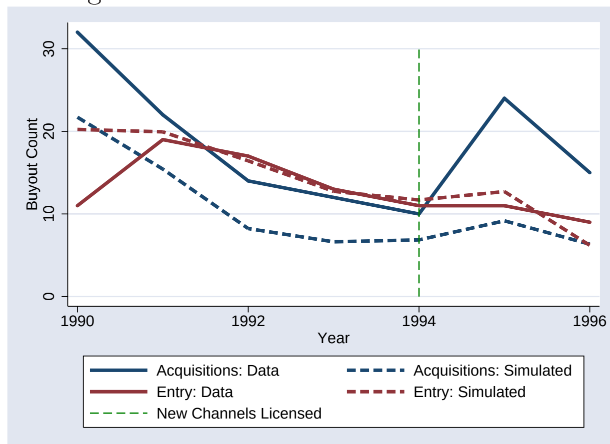


Figure 10: No Economies of Density

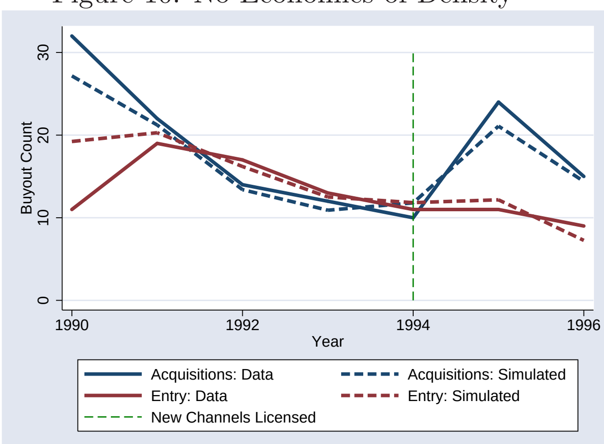
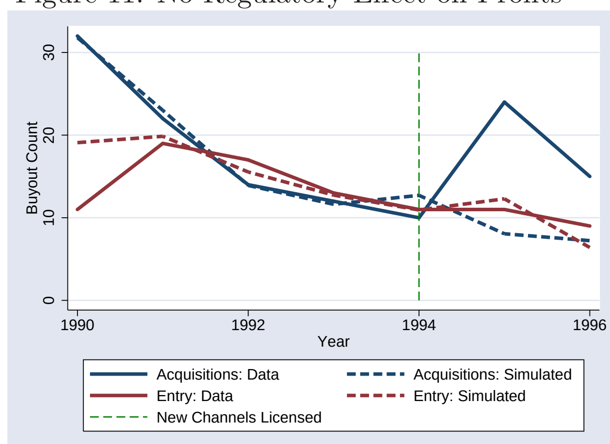


Figure 11: No Regulatory Effect on Profits



are illustrated by Figure 10. The impact on acquisition levels is modest as total acquisitions fall by 6.98% overall. There is a negligible rise in entry rates due to the slight reduction in incumbent merger activity. The fall in acquisitions arises from the direct effect of fixed costs not being reduced by agglomeration, but also an indirect effect as fewer acquisitions early in the sample, reduces the number of large firms that could later generate merger surplus through the scale effect on variable profits. Given the regional clustering of large cable companies observed in the data, this finding is somewhat surprising. It suggests that the large regional clusters emerged primarily from larger companies buying out small ones to capture surplus created by scale effects on variable profits, not large fixed cost savings due to economies of density.

The final experiment removes the impact that deregulation has on per-susbcriber profitability in 1994 and 1995 by setting $\beta^{dreg=1} = \beta^{dreg=0}$. Figure 11 clearly shows that without regulatory change acquisitions do not jump in 1995. Rather, they continue to monotonically decline, as firms deplete the remaining merger surplus in the industry over time. Acquisitions for 1995 and 1996 are predicted to fall by 66% and 52% respectively in the absence of the deregulatory effect on variable profit scale effects. Thus, deregulation largely accounts for the spike in acquisitions in the part of the sample. The predictions for entry levels are relatively unaffected, as the pre-1994 growth in incumbent cable companies is sufficient to supress entry in the latter part of the sample.

6.3 Merger and Entry Policy Experiments

Given the fact that the industry is likely to consolidate due to the scale effect on profits, a natural question to ask is how can policymakers increase the likelihood that the emerging dominant firms are relatively more productive. As incumbent firms grow over time, it becomes increasingly easy for them to continue acquiring smaller firms due to the scale effect. However, since new entrants enter the industry through the acquisition of smaller incumbent firms, scale-driven acquisitions by large incumbents can restrict entry activity. This ultimately prevents relatively more productive entrants from acquiring unproductive incumbents. The CRTC may therefore want to slow acquisition activity or subsidize entry early in the industry's life cycle to give productive entrants a chance to enter the industry before dominant firms are established.

I perform two sets of policy experiments that investigate the impact that entry subsidies or policies that increase merger costs (say through merger fees imposed by the CRTC) have on the long-run distribution of firm-specific effects as the industry consolidates. The first set of experiments look at entry subsidies that reduce entrant acquisition costs by one-quarter and one-half from 1990 to 1992. The second set of experiments impose merger fees that increase incumbent acquisition costs by one-quarter and one-half from 1990 to 1992. I forward simulate the data for 20 periods according to the six-step procedure outlined in Section 6.2 above. These simulations ignore any future changes in the industry, such as the entry of DBS or the introduction of phone, internet and cable bundling that arrive in the late 1990's.

Table 6: Merger Fees and Entry Subsidies Policy Experiments
Long-Run Firm-Specific Effect (β_4) Distribution

Experiment	Mean	Percentiles 2.5	5	25	50	75	95	97.5
Model Predictions	0.234	-0.436	-0.373	-0.122	0.048	0.234	0.537	2.971
25% Entry Costs, 3-year	0.272	-0.442	-0.388	-0.142	0.034	0.245	1.020	4.028
50% Entry Costs, 3-year	0.300	-0.439	-0.382	-0.131	0.044	0.254	0.947	4.528
125% Acquisition Costs, 3-year	0.325	-0.431	-0.374	-0.121	0.050	0.252	0.918	5.198
150% Acquisition Costs, 3-year	0.326	-0.429	-0.370	-0.126	0.052	0.254	0.867	5.313

Notes: Mean and percentiles correspond to distribution of β_4 at $T = 20$, where I assume local covariates for $t > 1996$ are as they are in 1996. The time-invariant, firm-specific effects are drawn from a normal distribution with mean zero and variance 0.251, which is estimated in the first step of the estimation procedure. All results are based on 500 forward simulations of the model.

The results from the simulations are presented in Table 6. I present the mean and seven percentiles from the distribution of the firm-specific effects in the industry for the 20^{th} year of the forward simulations.[35] For comparison, I provide predictions from the estimated model in the first row. Comparing the predictions from the first and the remaining four rows, I find that initial entry subsidies and acquisition fees yield higher average productivity. The rise in the mean of the firm-specific effects ranges from 16% to 39% across the four counterfactual policies. As illustrated from the percentiles, this rise in average productivity is driven by an increase in the mass in the right tail of the long-run productivity distribution. As the magnitude of the entry subsidies or merger fees increases, average productivity rises, and the increase is more pronounced for the rise in entry subsidies. The results further show that policies that increase merger costs are more effective in increasing long-run productivity. However, I am hesitant to draw absolute conclusions over which policy is “better,” since it depends on the chosen entry subsidy level or the factor by which acquisition costs are increased.

Although these results are specific to the Canadian cable television industry, they highlight a broader issue for merger or entry policies in industries where scale effects are present. In the long-run, dominant firms are likely to emerge in these industries, making entry by potentially more productive firms increasingly more difficult over time. The cable television provides an example of such an industry, however in other industries, such the rapidly growing social-media industry, there

[35] Formally, the distribution consists of: $\{\beta_{4imt} \mid i \in N_{mt}, m = 1 \ldots M, t = 2010\}$.

are also advantages to being large, and dominant firms are likely to arise in the long-run.[36] My findings suggest that entry subsidies or slowing initial acquisitions and consolidation in industries with scale effects can help ensure that a rich pool of entrants is initially established. The productive firms are more likely to remain, and they grow through their relative productivity advantage, as well as through scale effects over time. If unproductive firms are permitted to grow initially through acquisitions, they can subsequently grow and suppress potential entry solely through scale effects. It is this long-run outcome of having large, unproductive firms that initial entry subsidies or reduced consolidation rates can help avoid.

7 Conclusion

In this paper, I have developed a model of acquisitions and entry for an industry that is subject to exclusive territorial licensing. The model is estimated using unique profit and acquisition data for the Canadian cable television industry over the 1990-1996 period. I find that large cable companies earn more profits per subscriber than small ones, and that this scale effect is the main driver of acquisitions in the industry. Controlling for scale effects, economies of density are found to have a relatively smaller impact on firms' merger incentives than expected *a priori*. I also study the interaction between deregulatory policy and merger activity. The 1994 deregulation increases the scale effect on firms' profits, which gives large firms an additional incentive to buyout smaller cable companies. Through counterfactual simulations, I show that this policy change is largely responsible for the observed rise in acquisition behavior that follows the deregulation in the data. Finally, I provide a set of experiments that show how policies that stimulate entry or reduce acquisition levels in the industry's infancy can lead more productive dominant firms in the long-run.

Future research will evaluate the welfare effects of acquisitions in the industry. Using the price and channel data contained in the CRTC Master files, I can estimate a structural demand system for basic and non-basic cable as in Chipty (2001), which in turn can be used to calculate the welfare gains from the observed acquisitions in the data. As shown in this paper, large firms have

[36]In the case of social media, the industry is characterized by network-effects. In such industries there is a relative advantage to being large since larger networks are more valuable to consumers on those networks.

an incentive to buyout small firms in the cable industry, and in doing so they expand the channel options available to subscribers. Of interest is the extent to which such expansions in channel options yield welfare gains, and to what extent any welfare gains are offset by increases in the price of basic or non-basic service following acquisitions.

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A Tables and Figures

Table 7: Region Definitions

Region Name	Census Economic Regions	Total LSAs
Nova Scotia	10-50	75
New Brunswick	10-50	38
Quebec North	20, 50-70	109
Quebec South	25-45	80
Ontario East	10, 15, 90	145
Ontario South	20-80	47
Manitoba and Northern Ontario	95 (Ont.), 10-70 (Man.)	53
Saskatchewan	10-50	133
Alberta and Rockies	10-60 (Alb.), 30-40 (BC)	132
British Columbia	10, 20, 50-70	124

Notes: Economic regions correspond to their 2001 Census definitions. Economic region numbers correspond to within-province region definitions, with the exception of multi-provincial regions where both the within-province regions are listed, with province in brackets. The .pdf file that maps these regions can be found at: http://geodepot.statcan.ca/Diss/Maps/ReferenceMaps/n_er_e.cfm

Figure 12: CRTC Decision 89-46

Canadian Radio-television and Telecommunications Commission

Conseil de la radiodiffusion et des télécommunications canadiennes

Canada

Decision

Ottawa, 14 February 1989

Decision CRTC 89-46

Adelaide Radio & T.V. Limited

St. Mary's, Ontario - 882794100

Pursuant to Public Notice CRTC 1988-212 dated 22 December 1988, the Commission approves the application for authority to transfer effective control of Adelaide Radio & T.V. Limited, licensee of the broadcasting receiving undertaking serving St. Mary's, through the transfer of all of the common voting shares from the existing shareholders (the Tipping family) to Rogers Cable T.V. Limited (Rogers).

Rogers has proposed to purchase 100% of the shares of Adelaide Radio & T.V. Limited for the purchase price of $600,000. Based on information filed with the application, the Commission has no concerns with respect to the availability or adequacy of the required financing.

Rogers is a wholly-owned subsidiary of Canadian Cablesystems Limited, which in turn, is indirectly and ultimately controlled by Mr. Edward Rogers of Toronto.

Through various companies, Mr. Rogers owns CFTR and CHFI-FM Toronto and eight cablesystems in Ontario, one in Alberta and five in British Columbia. Mr. Rogers also holds a 25.4% interest in YTV Canada Inc., the youth-oriented specialty service; a 74.2% interest in the multilingual station CFMT-TV and a majority interest in the Canadian Home Shopping Network (CHSN) Ltd., a non-programming cable service.

As stated in a number of decisions relating to applications for authority to transfer ownership or effective control of broadcasting undertakings, and because the Commission does not solicit applications for such transfers, the onus is on the applicant to demonstrate to the Commission that the application filed is the best possible proposal under the circumstances, taking into account the Commission's general concerns with respect to transactions of this nature.

The Commission reaffirms that the first test any applicant must meet is that the proposed transfer of ownership or control yields significant and unequivocal benefits to the communities served by the broadcasting undertaking, to the Canadian broadcasting system as a whole, and that it is in the public interest.

In particular, the Commission must be satisfied that the benefits, both those that can be quantified in monetary terms and others which may not easily be measurable in terms of their dollar value, are commensurate with the size of the transaction and that they take into account the responsibilities to be assumed, the characteristics and viability of the broadcasting undertakings in question, and the scale of the programming, management, financial and technical resources available to the purchaser.
In assessing this application, the Commission has taken into consideration Rogers' commitment to provide St. Mary's with a level of cable service equivalent to that of the neighbouring Grand River system. Also, Rogers intends to extend the company's service hours thereby decreasing response time for service calls and improving accessibility to the cable company. The Commission also notes the extensive experience and resources upon which the purchaser may draw in order to maintain and improve service to subscribers.

In evaluating the benefits to be derived from this transaction, the Commission has taken into account that Rogers has committed to spend $568,000 to improve technical services $500,000 of which may be recovered through rate applications filed under subsection 18(6) of the Cable Television Regulations, 1986 (the regulations). In this respect, Rogers has committed to spend approximately $120,000 for improvements in the St. Mary's signal package by including in the channel line-up Canadian specialty services and FM services not currently available. Further, in this regard, Rogers has undertaken to rebuild the system in order to increase capacity on the basic service from 15 to 29 channels. The estimated capital cost of this proposal is $380,000.

Although an application to recover these capital expenditures which represent about $500,000 may be filed under subsection 18(6) of the regulations, the Commission notes Rogers' commitment that the basic monthly fee at St. Mary's will be no more than the authorized rate for the adjacent Grand River system.

Having examined the financial situation of the current licensee, the Commission notes that Adelaide Radio & T.V. Limited has experienced declining rates of returns on net fixed assets and, in this regard, considers that the licensee appears unable at present to finance basic on-going maintenance programs and would have difficulty financing the extensive capital improvements that will be necessary in the future.

In light of the foregoing, the Commission considers that these expenditure commitments will benefit St. Mary subscribers.
In addition, the purchaser has proposed quantifiable benefits totalling $68,000 that will accrue to subscribers through technical improvements and other programming and operating expenditures.

Specifically, Rogers will introduce by September 1989 full-service community programming that will, among other things, provide coverage of St. Mary's town council meetings. Also, Rogers will incorporate a descrambling system enabling subscribers greater flexibility in the selection of discretionary services.

The Commission has therefore concluded that the benefits, both intangible and quantifiable, are commensurate with the size of the transaction, the viability of the undertaking in question, the responsibilities involved and the resources available to the purchaser. In view of all the foregoing and having examined the information available to it, the Commission is satisfied that the proposed transfer of control will yield significant benefits to cable subscribers in St. Mary's and that approval of the application is in the public interest.

The Commission acknowledges the intervention received from Mr. Chris West in support of this application.

Fernand Bélisle
Secretary General

Figure 13: CRTC Decision 95-476

Canadian Radio-television and Telecommunications Commission Conseil de la radiodiffusion et des télécommunications canadiennes Canada

Decision

Ottawa, 24 July 1995

Decision CRTC 95-476

K-Right Communications Limited
Wellington, Abrams Village and Urbainville, Prince Edward Island - 942042300 - 942043100- 942044900

Acquisition of assets

Deletion of local head end and interconnection to the Summerside undertaking

Change to authorized service area

Following a Public Hearing in the National Capital Region beginning on 15 May 1995, the Commission approves the application for authority to acquire the assets of the cable distribution undertaking serving the above-noted communities from La Coopérative des Communications Communautaire Limitée (La Coopérative), and for a broadcasting licence to continue the operation of this undertaking.

The Commission will issue a licence to K-Right Communications Limited (K-Right), expiring 31 August 2002, upon surrender of the current licence. The operation of this undertaking will be regulated pursuant to Parts I and III of the Cable Television Regulations, 1986 (the regulations). The authority granted herein is subject to the same conditions as those in effect under the current licence, as well as to any other condition specified in this decision and in the licence to be issued.

The price of the transaction is $237,923. However, the Commission notes that the Purchase and Sale Agreement stipulates: "Should the CRTC not issue a license to the Purchaser permitting the construction of the System Extension or should the Purchaser not construct the System Extension before the earlier of the first anniversary of the Closing Date and April 30, 1996, the Purchase Price shall be increased by $63,000."

Based on the evidence filed with the application, the Commission has no concerns with respect to the availability or the adequacy of the required financing and is satisfied with the benefits flowing from this transaction.

In view of the approval granted herein, it would appear that no further action is required on the application (941086100) submitted by La Coopérative for the renewal of its licence which was announced in Public Notice CRTC 1995-10 dated 20 January 1995.

Nevertheless, in Decision CRTC 95-477 dated 1995, the Commission renewed La Coopérative's licence until 31 December 1995, in order to allow sufficient time for completion of the acquisition of assets approved herein.

Interconnection

The Commission also approves the application for authority to delete the local head end at Wellington and to interconnect that undertaking, via optical fibre, to the undertaking serving Summerside. The Commission notes that the Summerside undertaking is a Class 2 system and that the Wellington system is regulated pursuant to Parts I and III of the regulations. The Commission also notes that the number of programming services provided to the Wellington undertaking as part of the basic service would increase from 12 to 23.

The Commission also notes that the applicant will cease distribution of CBMT Montréal. The Commission also notes that the distribution of CHCH-TV Hamilton and CITV-TV Edmonton which are now available to Wellington subscribers as part of the basic service, will only be available on a discretionary basis

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In addition to the services required or authorized to be distributed pursuant to the applicable sections of the regulations, the licensee is authorized to continue to distribute, at its option, CFJP-TV Montréal, received via satellite, as part of the basic service.

The applicant is also authorized, by condition of licence, to continue to distribute the programming service of the Atlantic Satellite Network (ASN), received via satellite, provided that it is distributed on an unrestricted channel of the basic service.

Change to authorized service area

The Commission also approves the application to change the licensed area for the Wellington undertaking by including the communities of St. Chrysostome, Cape Egmont and St. Timothy. The Commission notes that the subscribers in the extended area will be offered the same programming services and will be charged fees identical to those in the current licensed service area.

This approval is subject to the requirement that construction in the extended area be completed and the extended system be in operation within twelve months of the date of this decision or, where the applicant applies to the Commission within this period and satisfies the Commission that it cannot complete the construction and commence operations throughout the extended system before the expiry of this period and that an extension of time is in the public interest, within such further periods of time as are approved in writing by the Commission.

Should construction not be completed within the twelve-month period stipulated in this decision or, should the Commission refuse to approve an extension of time requested by the applicant, the authority granted to change the service area shall lapse and become null and void upon expiry of the period of time granted herein or upon the termination of the last approved extension of time period.

In Public Notice CRTC 1992-59 the Commission announced implementation of its employment equity policy. It advised licensees that, at the time of licence renewal or upon considering applications for authority to transfer ownership or control, it would review with applicants their practices and plans to ensure equitable employment. In keeping with the Commission's policy, it encourages the applicant to consider employment equity issues in its hiring practices and in all other aspects of its management of human resources.

The Commission acknowledges the intervention submitted by the Canadian Broadcasting Corporation, expressing its wish that the applicant consider the distribution of the Réseau de l'information (RDI). A similar intervention was submitted by the Société Saint-Thomas-d'Aquin.

In reply, the applicant stated that this fall it will address the carriage of RDI as well as other services to be added 1 January 1996. While the Commission notes that RDI is not a priority programming service, it reiterates the importance of Canadian programming services being given the widest possible distribution. The Commission encourages the applicant to take intoconsideration the Canadian Cable Television Association (CCTA) Access Commitment with respect to the carriage of licensed Canadian specialty, pay television and pay-per-view services in minority official language markets.

Allan J. Darling
Secretary General