Does Regulation Drive Competition? Evidence from the Spanish Local TV Industry

Ricard Gil
Johns Hopkins University

Mitsukuni Nishida
Johns Hopkins University

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Abstract

Although we have many tools to understand the e ect of regulation on competition, we

1 Introduction

The role of market regulation has generated much attention in Economics.[1] Because regulation will ultimately a ect welfare, correctly interpreting and measuring the impact that regulation has on market outcomes is important. Focusing on the enforcement of regulation is equally important because government may not enforce the regulation to the degree it is formally announced. Even the legislation of market regulation that is clearly stated and understandable to industry participants does not guarantee that the government will literally interpret and enforce regulation. Rather, several factors can prevent the government from implementing the regulation.[2]

Although we have many tools to understand the e ect of regulation on competition, we know little about the importance of enforcement in explaining the impact of regulation in an industry, in part because the implementations often are not observable. As a result, most of the evidence on the in

di erent scenarios that di er in regulation status, and also in that we investigate how changes in regulation a ect market entry, by focusing on the fixed costs and variable profits. Schaumans and Verboven (2008) analyze the restricted entry in pharmacies and physicians under the assumption that the entry restrictions are strictly binding. By contrast, our paper models the regulation on the number of stations as a ecting the fixed costs of a firm, because as we observe later, the entry restrictions are not always binding; the authorities have not fully enforced the regulation, and we seek to recover from the data the degree to which they implement the regulation.

The paper is organized as follows. In section 2, we describe the institutional details of the Spanish local TV industry and the introduction and change of regulation. Section 3 presents the data. In section 4, we describe the empirical specifications, and show and discuss our results. Section 5 relates the empirical results to the changes in the regulation status across years, and Section 6 concludes.

2 Institutional Details

This section builds on information obtained in personal interviews with industry managers and previous work (Gil and Riera-Crichton (2011)). Television stations maximize profits in two ways due to their two-sided and network structure. They produce content that they sell to television consumers through subscription fees, or sell television space to advertisers. Because television consumers value television content free of advertising, and advertisers value the number of television viewers, stations choose accordingly the amount of advertising and the value of the subscription fee to maximize total profi

2.1 European versus American Model of Local Television

To understand how competition in the Spanish local television industry worked, we first need to point out the main di erences between television markets in Europe and in the United States. The US market has been mainly characterized by its little government intervention and its verticality, whereas the European markets are traditionally characterized by strong government intervention and their lack of verticality.

Big stations in big markets first began and dominated the US TV industry. As smaller stations started to arise in smaller markets, they were dependent on the dominant stations because the latter were the main providers of content. Eventually, these relationships of content exchange were so frequent that dominant stations and local stations formed what we know today as TV networks. Nowadays, local stations are ascribed to the networks, and even though the network directly provides some of their content, they still produce a steady share of their programming that reflects the local demand.

These characteristics di er much from the European case. The European TV industry was mainly monitored by the government of each respective country. Entry in this industry was highly regulated and the emergence of local stations was limited. Most countries entered the 1980s with only government-owned stations and, at most, a few regional stations that broadcast for a limited range of their national territory. Given the dominant role that national and regional stations played, no room remained for local stations, because regulation did not acknowledge them as legal entities. In other words, local stations were alegal because no regulation banned or acknowledged their existence. Because this paper studies the Spanish case and the consequences of changes in regulation on competition, we now describe the case of Spain.

Spain had two TV stations until the mid 1980s, TVE and TVE2. The former was the main station and the latter served as window to minority content and local news emitted from small satellite stations that had little independence in their programming decisions. During the mid 1980s and the consolidation of the new democratic regime, the central government granted the right to its regional counterparts to develop regional stations. Still, the law did not recognize the local TV stations as entities. Despite this fact, a number of local stations were created in the late 1980s as a result of the joint e

Many other local stations were created in the following years and, as their activities grew in importance both economically and culturally, the need for a legal framework became clear to many politicians and regulators.[5] As a result of this need, the Spanish government approved the law of local TV stations in December of 1995 (Law 41/1995, BOE 309, 27-12-1995) to be implemented in 1996 as the year came to an end. The new regulation pretended to regulate the composition, commercial activities, ownership, and competitive structure of the local TV station industry in Spain. This law limited the local stations' market to its city, and as a consequence, communication scholars have characterized local stations as providers of "proximity television" to di erentiate them from the role played by national and regional stations. Some of the most controversial points of the 1995 law were that no more than two local stations were allowed per city (regardless of city population), network formation was prohibited (and therefore any possibility of collusion), and all local TV stations were to have local government personnel on their advisory and executive boards.

2.2 Liberalization of the Spanish Local TV Industry

The Spanish election in March of 1996 has a ected how the government implemented the 1995 law. The left-winged PSOE party lost the election, and the new party in power, the right-winged Partido Popular (PP hereafter), had a di erent perspective on how the Spanish local television industry should be regulated, if at all. In short, PP believed this industry needed to be deregulated and liberalized; therefore, PP planned a formal liberalization process that proved to be rockier than first anticipated. However, due to the lack of support in congress, this new government's initiative did not go forward. As a consequence, the government chose not to fully implement the 1995 regulation passed by the PSOE. Badillo (2003) documents how the government chose not to fully enforce the 1995 law, although he gives anecdotal evidence of how some type of selective enforcement of the law took place depending on whether the local TV station was located in a city governed by PSOE (whereas the enforcement of the law was definitely laxer in cities ruled by PP o cials). Other exceptions were those regions, such as Catalonia, that chose to start developing the law themselves with little support from the central government.

An example of a violation prior to the passing of the 2002 law was that because the government

[5] We do not have audience ratings prior to the year 2000, but the local station sector was responsible for a 0.6%, 1.1%, and 1.7% market share for the years 2000, 2002, and 2004, respectively. These percentages may seem low compared to the top national channel with 28.3%, 29.1%, and 24%, but the shares are indeed sizable relative to the 4.2%, 3.7%, and 4.2% captured by regional stations, given the di erences in resources available to local stations relative to their regional counterparts.

every 1 000 people in each city. Finally, 56% of the cities in the data belong to coastal provinces. This last variable is important because land prices and population density are higher on the coast than they are inland.

Table 4 repeats the exercise in Table 3, breaking the sample by year. This table shows the average number of stations decreased from 1995 to 1998, but grew again by 2001 to slightly higher levels than 1995. This overall growth in the number of stations is mainly driven by two extremes, the number of cities with a monopoly station and those cities with five or more stations. The number of cities with two, three, or four stations stayed rather stable during this period of time. The average population size grew from 11 927 to 12 558 and so did the population growth from 1 1% to 6%. All other indicators indicate an improvement in the overall economy as unemployment rates decreased from 5 1% to 3 1% and the number of cars per person increased from 0 33 to 0 41. Finally, the number of bank o ces per every thousand people decreased from 0 44 to 0 35. This tendency reflects the fact that bank entry did not follow the increase in population observed in the data.

Because the goal of this paper is to study the impact of changes in regulation between 1995 and 2001 on entry thresholds in order to study changes in the nature of competition, an understanding of how market structure changed between 1995 and 2001 in a city per-city basis is useful. For this purpose, Tables 5, 6, and 7 cross-tabulate the number of local stations per city for all possible pairs of years. Table 5 tabulates the number of local stations per city in 1995 and 1998, whereas Tables 6 and 7 do so for census 1998 and 2001, and 1995 and 2001, respectively. Table 5 shows how 162 cities with local stations in 1995 had none in 1998. On the other hand, 141 cities with no stations in 1995 observed entry in 1998. Overall, 2 506 cities did not have local stations in 1995 and 1998, whereas 400 cities had a positive number of stations in both years.

and 88 saw it decreased.

Table 8 cross-tabulates changes in the number of stations between census years 1995-1998 and 1998-2001. This table shows the number of local stations remained constant between 1995 and 2001 for 2 629 cities. Only 21 cities saw their number of stations increase in both periods of time, whereas only 6 cities saw their number of stations decrease in both periods. This table shows most changes occurred between 1995 and 1998 since the number of cities with no changes between 1998 and 2001 increases to 2 945 cities.

The last source of data that we include in this paper is the electoral outcomes from the May

4.1 Empirical Specifications

This paper infers how mark-ups vary with entry by estimating entry thresholds by observing the number of establishments. In what follows, we employ the empirical entry model from Bresnahan and Reiss (1990, 1991) (BR hereafter), and adapt the framework to the features of the Spanish local TV station industry.

We model the Spanish local TV station industry as a homogeneous-goods industry.[8] The demand for local TV stations takes the form

$$= ( ) ( )$$

where ( ) is the demand of each individual in a given market and ( ) is the number of consumers in a market. stands for prices, and and are demographic characteristics.

On the cost side, we assume firms incur fixed costs ( ) and marginal costs ( ), where represents technology variables that exogenously shift the cost of firms, whereas stands for the scale of production. The assumption of firms being homogeneous may seem reasonable for the Spanish local TV industry.

interested in estimating the firm-entry threshold ratios = — and see how the ratios vary with . The ratio — where measures either the fall in variable profits per customer between a market with firms and a market with firms or an increase in the fixed costs with the number of stations.

Given the data from the AIMC census on local TV stations, we are far from having price and output data for all stations in all markets. For this reason, we estimate entry thresholds by running an ordered probit on the number of stations in each market. The model posits if we observe stations in a given market, it must be the case that in equilibrium $\Pi \geq 0$ and Π_{+1}

olds by plotting the formula

$$\hat{} = \frac{\hat{}}{\hat{}} = \frac{\hat{}_1 + \overline{\hat{}} + \sum_{=2} \hat{}}{\hat{}_1 + \overline{\hat{}} - \sum_{=2} \hat{}}$$

where the bar over each variable stands for the sample mean of the variable. The estimated per-station entry thresholds are $\hat{} = \hat{}$.

The next section shows results of this estimation for each year in our data.

4.2 Parameter Estimates

This section discusses the parameter estimates of the empirical specifications. Table 10 shows the structural parameters that correspond to the profit model above in the methodology section. This table contains six columns. The three columns on the left correspond to the full model outlined in the previous section, as we run an ordered probit separately for the three years in our sample: 1995, 1998, and 2001. We exclude the $_6$ in 1995 and 2001 from the baseline specification, because the specification including the variable yields estimated a negative sign for $_6$, violating our model assumption that late entrants will have fewer profi

to be smaller in markets that violate the 1995 law than in those markets that do not violate the regulation. This negative sign may be puzzling, but the parameter may just be picking up some unobserved market heterogeneity. Unfortunately, we do not have additional variables to identify these two e ects separately. Instead, we run a separat

ratios in the number of stations for each of the sample years. A distinctive pattern emerges in 1998 at $_{2\ 1}$, $_{5\ 4}$, and $_{6\ 5}$. For instance, the ratio $_{2\ 1}$ takes the value of 1 20 in 1995, 1 67 in 1998, and 1 12 in 2001. Given that 1998 is the only period in the data during which the strict regulation is enforced, observing a deviation in 1998 may not be surprising. However, the ratios $_{+1}$ do not fully reveal the sources of the divergences in 1998. In the next section, we discuss in greater detail the e ects of the regulation status on entry by decomposing the ratios.

5 Evaluating the Impact of Regulation on Competition

This section relates the empirical results to the changes in regulation status across three periods. The first period is 1995, determined in a frame in alegality. The second period is after the regulation took place in 1995-1996 to control competition. The third period is the silent deregulation aiming to liberalize the industry after the 2000 election. We compare results across years to determine the relation between regulation and competition. Again, our focus is on the change from = 1 to 4 because the competitive e ect $'$ and fixed costs $'$ are all precisely estimated up to the fourth entrant.

Recent studies on entry and regulation incorporate the institutional details of regulations, and use an equilibrium entry model to obtain the e ect of policy on market entry. This paper does the opposite. We back out from the results whether and how the regulation was enforced and e ective in impacting how the local TV stations compete. This approach is useful for public policies of which enforcement and e ect on the competition of firms are not obvious. This case is especially true in the Spanish local TV industry, where we observe obvious local violations of the regulation, as we document in an earlier section.

Figure 4 illustrates the entry threshold . In 1995 and 2001, the population needed to support

bo7(3(of)]TJ/TT61)-31.25680TD0Tc()pTj/TT21Tf.55190TD-3022Tc[ee 199822.5(,7(m)5.4(s)6e)4.ighrlier659.9(p)-t

Because the launch of the regulation policy in the 1995 law could a ect both demand and cost sides, simply focusing on the change in , or their ratios across the number of stations and across years may not fully reveal the sources of these gaps. We normalize the ratio by the fixed costs or the variable costs of the first entrant, $_1$ and $_1$.

Figure 5 plots the ratio $_1$ by the number of stations ( ) for each year. In 1998 and 2001, we observe an obvious positive gap in the ratio of the fixed costs $_1$ relative to the same ratio in 1995 for any given number of stations. This pattern implies that in 1998 and 2001, the fixed costs of the second entrant relative to the fixed costs of the first entrant increase at the second entrant, and the ratio $_{-1}$ stays constant across years beyond the second entrant. This empirical pattern is consistent with the nature of the regulation status across years: even after the deregulation period, the policy states no more than two stations should be present unless the city has a population of more than 250 000 people, which is di erent from the alegal status of the industry in 1995. In other words, the regulation in 1995 had a positive impact on the costs in 1998, and this e ect is permanent even when the industry is "deregulated" after 2000.

To formally examine this conjecture about the change in the

ownership patterns. This silent deregul

profits. Overall, we find the model parameters are quite informative about how the change in the regulation status has impacted the market entry and how strongly the government enforces the

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Figure 1. Station Entry vs. Regulatory Activity 1997 to 2002

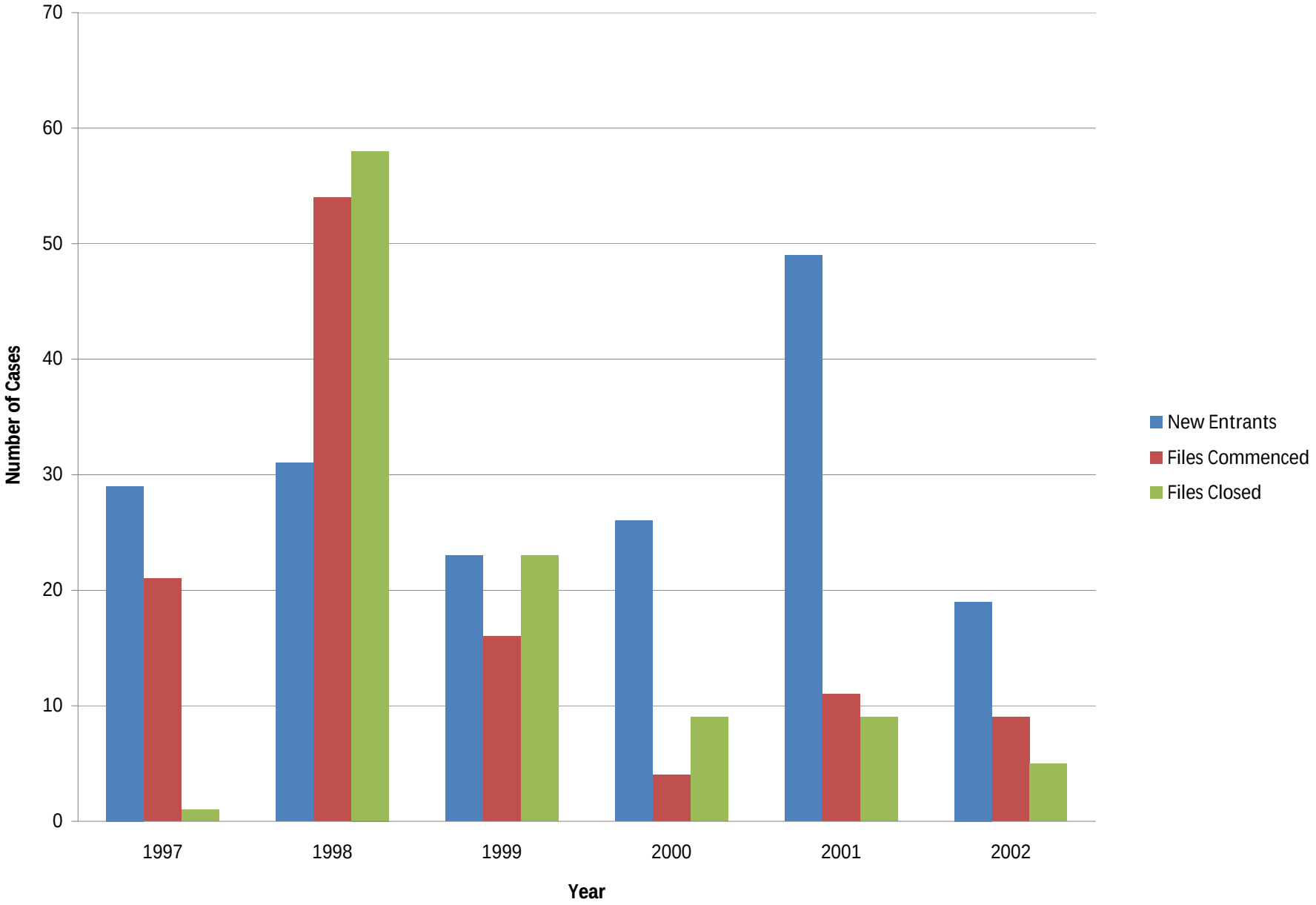
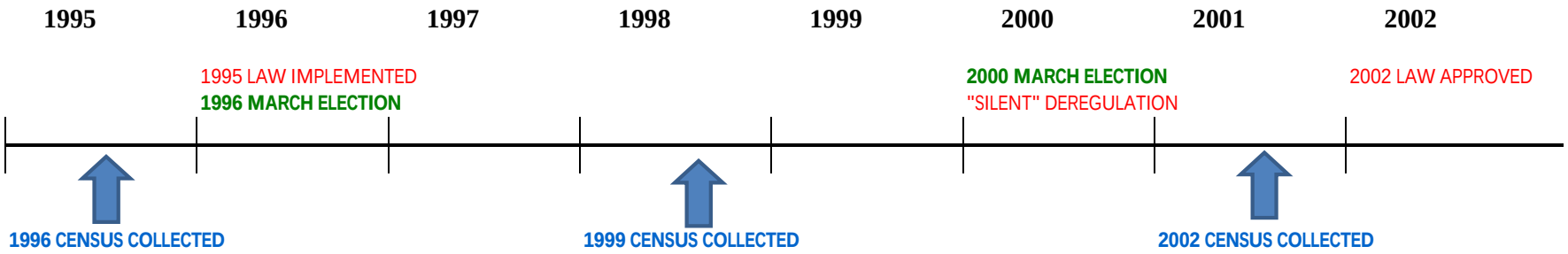


Figure 2. Timing of Election, Regulation Changes and Data Collection



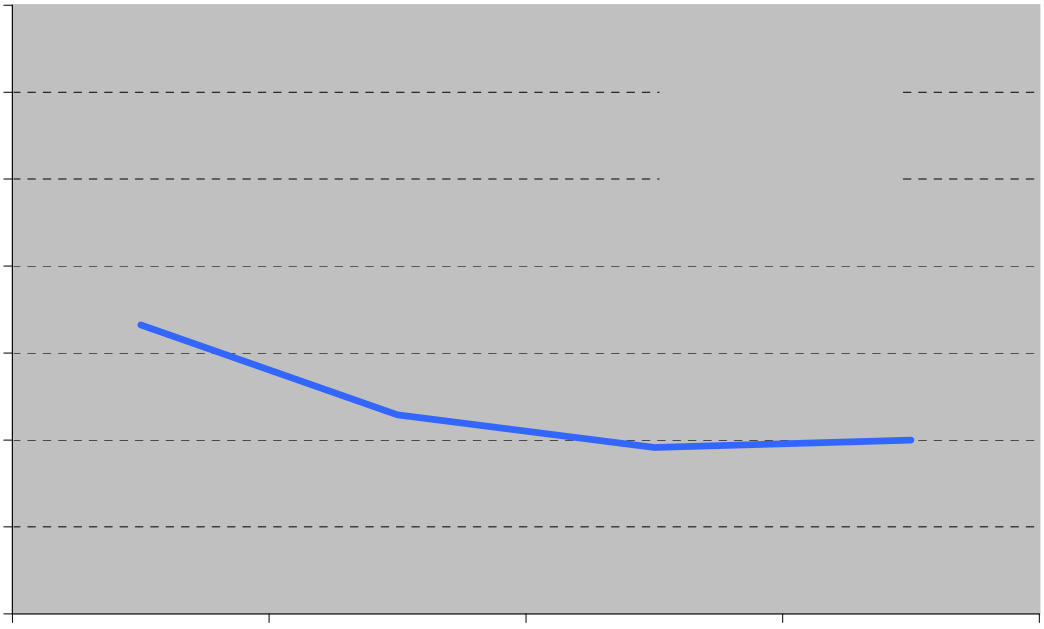


Figure 5. Fixed Costs Ratio F_N/F_1, 1995 2001

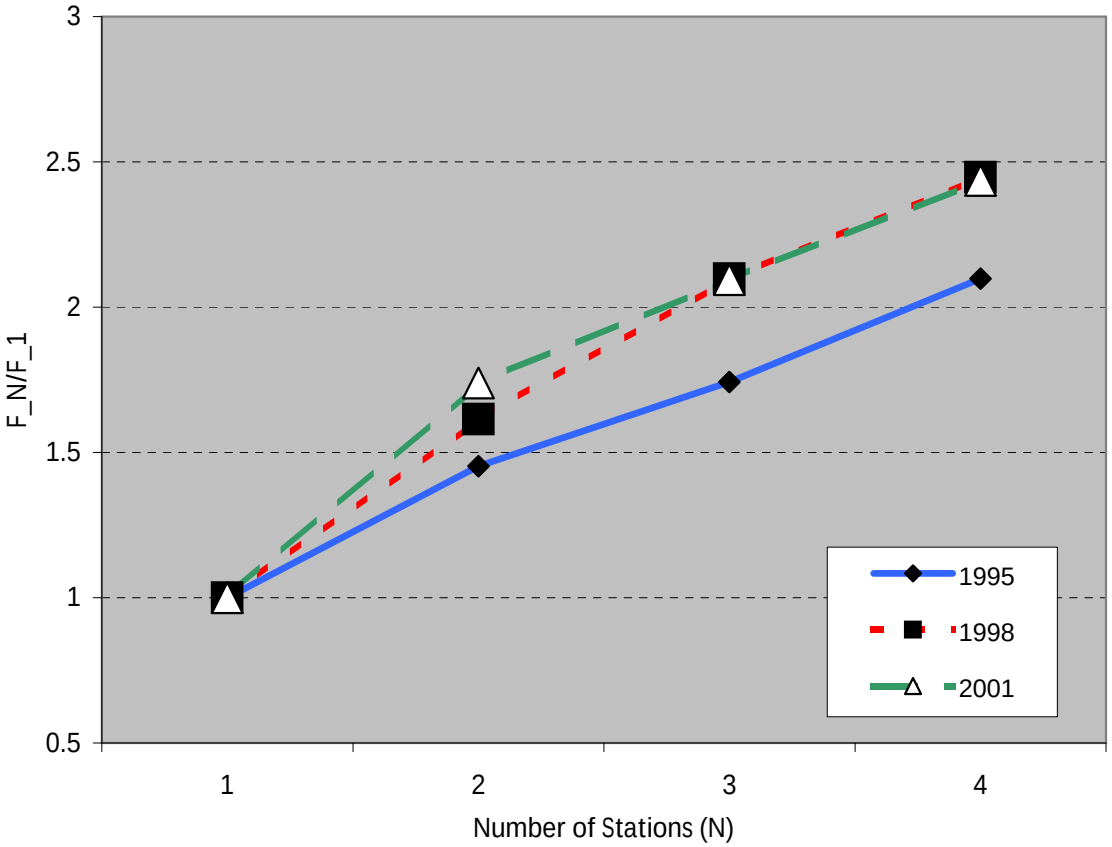


Figure 6. Per Customer Variable Profits Ratio V_N/V_1, 1995 2001

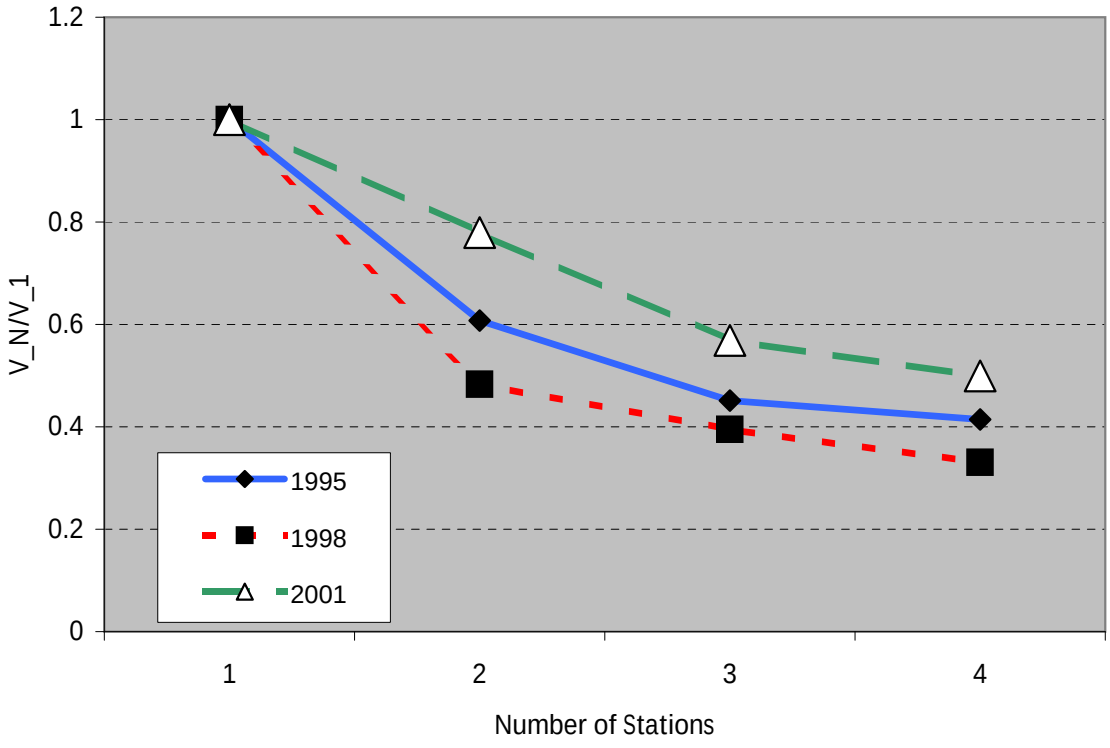


Table 1. Tabulation for Advertising and Broadcasting for all Years

Market for TV Content	No Info	No Adv	Adv	Total
No Info	**6**	**5**	**13**	**24**
Broadcast	**18**	**152**	**839**	**1009**
Pay-per-View	**6**	**83**	**153**	**252**
Total	**30**	**240**	**1015**	**1,285**

Note: This table tabulates advertising and broadcasting decisions for the 1,285 TV stations we have information across years.

Table 2. Advertising and Broadcasting per Year

Year 1995

Market for TV Content	Market for TV Advertising: No Info	No Adv	Adv	Total
No Info	4	0	1	5
Broadcast	3	16	128	147
Pay-per-View	2	3	26	31
Total	9	19	155	183

Year 1998

Market for TV Content	Market for TV Advertising: No Info	No Adv	Adv	Total
No Info	2	2	4	8
Broadcast	4	70	259	343
Pay-per-View	3	33	70	106
Total	9	105	343	457

Year 2001

Market for TV Content	Market for TV Advertising: No Info	No Adv	Adv	Total
No Info	0	3	8	11
Broadcast	11	66	442	519
Pay-per-View	1	47	67	115
Total	12	116	517	645

Note: This table tabulates advertising and broadcasting decisions for the 1,285 TV stations we have information for each separate year in our sample.

Table 3. Summary Statistics Across All Census Years

Variable	Obs	Mean	Std. Dev.	Min	Max
Stations HQ per City	9627	0.26	0.77	0	17
Monopoly?	9627	0.133	0.339	0	1
Duopoly?	9627	0.027	0.162	0	1
Triopoly?	9627	0.009	0.092	0	1
Quadropoly?	9627	0.003	0.055	0	1
Five Stations or More?	9627	0.004	0.065	0	1
Stations not HQ per City	9627	1.407	1.885	0	13
City Population (000)	9627	12.17	67.73	0.32	3016.79
City Growth	9627	0.04	0.11	-0.78	5.73
Province Population (000)	9627	1223.66	1363.04	56.93	5527.15
Province Growth	9627	0.03	0.03	-0.05	0.22
Unemployment Rate per City	9627	3.89	1.90	0	25
Cars per capita and City	9627	0.37	0.15	0.04	7.08

Table 4. Summary Statistics by Census Year

Variable	Year 1995	Year 1998	Year 2001

Table 5. Cross-Tabulation of No Stations per City for Years 1995 and 1998

	No Stations per City Year 1998										
No Stations per City Year 1995	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**12**	**13**	**Total**	
0	2,506	131	9	1	0	0	0	0	0	2,647	
1	153	218	30	5	1	0	0	0	0	407	
2	8	60	24	2	3	1	0	0	0	97	
3	1	14	9	9	0	0	0	0	0	33	
4	0	2	4	2	0	1	0	0	0	9	
5	0	2	1	0	0	0	0	0	0	3	
6	0	0	0	1	2	0	1	0	0	4	
7	0	0	1	0	1	0	0	0	0	2	
8	0	0	0	0	1	0	0	0	0	1	
9	0	0	0	1	0	0	0	1	0	2	**9**

Table 6. Cross-Tabulation of No Stations per City for Years 1998 and 2001

	No Stations per City Year 2001													
No Stations per City Year 1998	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**13**	**16**	**Total**
0	2,571	93	4	0	0	0	0	0	0	0	0	0	0	2,668
1	48	328	36	11	2	2	0	0	0	0	0	0	0	427
2	3	22	35	11	4	2	0	0	0	1	0	0	0	78
3														

Table 7. Cross-Tabulation of No Stations per City for Years 1995 and 2001

	No Stations per City Year 2001													
No Stations per City Year 1995	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**13**	**16**	**Total**
0	2,464	167	14	1	1	0	0	0	0	0	0	0	0	2,647
1	147	213	33	8	3	3	0	0	0	0	0	0	0	407
2	8	56	17	9	5	3	0	0	0	0	0	0	0	98
3	4	6	14	7	0	2	0	0	0	0	0	0	0	33
4	0	1	3	2	1	0	0	0	1	0	1	0	0	9
5	0	0	2	1	0	0	0	0	0	0	0	0	0	3
6	0	0	0	1	0	0	2	1	0	0	0	0	0	4
7	0	0	0	0	0	0	1	0	0	1	0	0	0	2
8	0	0	0	0	0	1	0	0	0	0	0	0	0	1
9	0	0	0	0	0	1	0	0	0	0	0	1	0	2
13	0	0	0	0	0	0	1	0	0	0	0	0	0	1
15	0	0	0	0	0	0	0	0	0	0	0	0	1	1
17	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total	2,623	443	83	29	11	10	4	1	1	1	1	1	1	3,209

Note: This table shows results of cross-tabulating the number of stations per city in 1995 with the number of stations per city in 2001.

Table 8. Cross-Tabulation of Changes in No Stations per City between 1995-1998 and 1998-2001

	Change in No Stations Censuses 1998-2001									
Change in No Stations Censuses 1995-1998	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**	**8**	**Total**
-13	0	0	0	1	0	0	0	0	0	1
-7	0	0	0	1	0	0	0	0	0	1
-6	0	0	0	0	0	1	0	0	0	1
-5	0	0	0	0	0	0	0	0	1	1
-4	0	0	0	0	3	0	0	0	0	3
-3	0	0	0	3	2	1	0	0	0	6
-2	0	0	2	12	7	5	2	1	0	29
-1	0	1	3	175	35	8	1	0	1	224
0	0	1	36	2,629	82	7	2	1	0	2,758
1	0	0	33	115	13	1	2	0	0	164
2	1	2	4	7	2	1	0	0	0	17
3	0	0	0	2	2	0	0	0	0	4
Total	1	4	78	2,945	146	24	7	2	2	3,209

Note: This table shows results of cross-tabulating the changes in number of stations per city between censuses 1995-1998 and censuses 1998-2001.

Table

Table 10. Parameter Estimates from Ordered Probit Regressions

	Baseline			Robustness check		
Variables	1995	1998	2001	1995	1998	2001
province population (λ_1)	0.000745	0.000251	-0.000619			
	(0.000607)	(0.000771)	(0.000779)			
city population growth (λ_2)	0.00236	0.000558	0.00225**	0.00280	0.000611	0.00213**
	(0.00226)	(0.000842)	(0.00105)	(0.00221)	(0.000828)	(0.00105)
province population growth (λ_3)	0.0454***	0.00925***	0.00944***	0.0428***	0.00919***	0.00951***
	(0.0116)	(0.00302)	(0.00309)	(0.0112)	(0.00299)	(0.00315)
unemployment	-16.83***	-9.655*	-4.724	-18.29***	-9.924*	-4.593
	(5.215)	(5.586)	(5.550)	(5.201)	(5.555)	(5.456)
cars	-226.5*	-56.57	-153.5*	-227.6*	-60.10	-144.6*
	(133.3)	(123.6)	(87.68)	(138.0)	(125.1)	(83.60)
banks	-53.78	63.70	128.1**	-66.07	67.97	120.6**
	(52.12)	(53.18)	(51.21)	(53.01)	(53.05)	(49.80)
α_1	603.5***	343.5***	331.8***	621.1***	345.2***	326.3***
	(71.94)	(61.00)	(53.96)	(71.24)	(61.11)	(52.07)
α_2	164.1***	164.5***	65.97***	165.8***	165.9***	66.21***
	(26.90)	(24.20)	(23.75)	(27.02)	(24.17)	(23.50)
α_3	65.44***	27.98	62.96***	69.41***	32.19*	70.34***
	(18.63)	(19.50)	(21.00)	(18.39)	(18.72)	(19.98)
α_4	15.17	20.51	20.88			
	(19.73)	(24.87)	(19.58)			
α_5	6.304	59.59**	14.48	8.761	70.11***	19.17
	(17.08)	(24.81)	(20.32)	(17.62)	(22.13)	(20.54)
α_6		21.01				
		(38.30)				
γ_1	2.643***	2.636***	2.792***	2.568***	2.617***	2.831***
	(0.146)	(0.147)	(0.149)	(0.133)	(0.137)	(0.141)
γ_2	0.722***	0.896***	1.061***	0.737***	0.898***	1.049***
	(0.0680)	(0.0723)	(0.0764)	(0.0652)	(0.0702)	(0.0765)
γ_3	0.462***	0.705***	0.510***	0.456***	0.681***	0.466***
	(0.0936)	(0.137)	(0.124)	(0.0903)	(0.132)	(0.117)
γ_4	0.569***	0.509**	0.491***	0.687***	0.678***	0.673***
	(0.182)	(0.240)	(0.190)	(0.117)	(0.150)	(0.123)
γ_5	0.384*	0.0617	0.287	0.373	0.0323	0.247
	(0.232)	(0.185)	(0.265)	(0.229)	(0.170)	(0.256)

Table 11. Calculation of Fixed Costs, Variable Profits per Consumer, and Entry Thresholds

Year	# of Stations **(N)**	F_N	V_N	S_N (= F_N/V_N)	$s_N = S_N / N$
1995	1	1.60	418.13	0.0038	0.0038
	2	2.32	254.00	0.0091	0.0046
	3	2.78	188.56	0.0147	0.0049
	4	3.35	173.39	0.0193	0.0048
	5	3.73	167.09	0.0223	0.0045
	6 or more	3.93	167.09	0.0235	0.0039
1998	1	1.46	318.21	0.0046	0.0046
	2	2.35	153.68	0.0153	0.0077
	3	3.06	125.69	0.0243	0.0081
	4	3.57	105.18	0.0339	0.0085
	5	3.63	45.59	0.0796	0.0159
	6 or more	3.81	24.59	0.1550	0.0310
2001	1	1.44	299.15	0.0048	0.0048
	2	2.50	233.18	0.0107	0.0054
	3	3.01	170.22	0.0177	0.0059
	4	3.50	149.34	0.0234	0.0059
	5	3.79	134.87	0.0281	0.0056
	6 or more	4.68	134.87	0.0347	0.0058

Note: This table calculates the implied from the model fixed costs F, variable profits V, and S = F / V.

Table 12. Per-Firm Entry Threshold Ratios by Year

Year	**S_2 / S_1**	**S_3 / S_2**	**S_4 / S_3**	**S_5 / S_4**	**S_6 / S_5**
1995	1.20	1.08	0.98	0.93	0.88
1998	1.67	1.06	1.05	1.88	1.62
2001	1.12	1.10	0.99	0.96	1.03

Table 13. Likelihood Ratio Tests for Constant Fixed Cost Ratios over Time

Null hypothesis	**F_2 / F_1**	**F_3 / F_1**	**F_4 / F_1**	**F_5 / F_1**	**F_6 / F_1**
$F_{N/F1,1995} = F_{N/F1,1998}$					
Test statistics	8.12	12.13	4.15	0.58	0.18
Prob. > chi square	0.00	0.00	0.04	0.45	0.67
$F_{N/F1,1998} = F_{N/F1,2001}$					
Test statistics	3.51	0.00	0.00	0.41	4.58
Prob. > chi square	0.06	0.97	0.95	0.52	0.03