EXHIBIT B

Rev Ind Organ (2009) 34:135–152
DOI 10.1007/s11151-009-9205-4

A Consideration of Telecommunications Market Structure in the Presence of Municipal Provision: The Case of US Cities

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Published online: 28 February 2009
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Abstract We consider the effect of government-owned telecommunications providers on privately owned rivals by comparing the presence of private telecommunications services providers alongside municipal competitors in the US telecommunications industry from 1999 through 2002. Our primary finding is that the presence of a municipal provider is negatively correlated with a city's having private providers. However, the marginal effects indicate that the effect of municipal competition on private provision is largely concentrated on the first entrant, suggesting cities may choose to provide telecommunications services in areas with inadequate demand to support private provision.

Keywords Competition · Municipal telecommunications provision

1 Introduction

There are numerous instances in which the government competes with private business. Many of these cases occur at the city, or municipality, level. For example, public schools

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may compete with private schools, municipal electric providers may compete with private electric providers, and municipal telecommunications providers may compete with private telecommunications providers.

For the government to be a competitor in such markets raises issues of whether the government will compete fairly. Furthermore, the presence of a government-owned enterprise may dissuade a legitimate, private entrepreneur from entering a market. On the other hand, a government-owned enterprise may be able to provide a service that citizens view as important but that may not be commercially feasible for a private operator.

For the past decade there has been controversy in the United States over whether municipalities should be permitted to offer telecommunications services in competition with private providers. Municipal investment in telecommunications services may provide socially beneficial competition for incumbent telecommunications providers. Municipalities may enter the telecommunications market to provide citizens with services that private companies cannot or will not provide; to offer lower prices than does the incumbent; and to take advantage of scale and/or scope economies available to municipalities that concurrently are providing electricity service. Finally, a municipally owned utility providing telecommunications services may enjoy unique cost advantages over a private company that is serving the telecommunications market only (as is argued by The American Public Power Association (APPA))

This positive motivation is questionable. Government-owned service providers may have an unfair advantage over private operators because they are essentially subsidized by captive taxpayers and may deter more efficient private investment.[1] These possibilities along with related others have resulted in fourteen states' adopting either a complete ban on municipal telecommunications provision or creating significant barriers to entry (APPA 2004). The Telecommunications Act of 1996 provides that no state regulation should prohibit any entity from providing telecommunications services, but in 2004 the US Supreme Court ruled that this statute does not prohibit states from adopting restrictions on local governments' providing telecommunications services.[2] As of December 2007, the following states had passed laws restricting municipal telecommunications provision: Arkansas, Florida, Minnesota, Missouri, Nebraska, Nevada, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin.[3]

In this paper, we consider the competitiveness of public and private enterprises; specifically, we examine telecommunications provision by competitive local exchange carriers providing landline telecommunications services (CLECs), taking into account the potential existence of a municipally owned telecommunications carrier (MUNI) and other CLECs. A CLEC is a privately owned telecommunications provider that

[1] It is beyond the scope of this paper to analyze how municipal service providers are financed. Indeed, this is a topic for further study in order to determine the welfare effects of municipal provision on the municipality's residents.

[2] Nixon v. Missouri Municipal League, 541 US 125 (2004).

[3] The setback for municipalities is not complete however, as the Federal Communications Commission (FCC) has indicated that while states may have the right to restrict municipalities, states should not inhibit competition.

serves a market in competition with an incumbent local exchange carrier (ILEC) and potentially other CLECs.[4] A MUNI is a telecommunications carrier set up and financed by a municipality in competition with an ILEC and/or a CLEC.[5]

We utilize a unique data set containing all CLEC and MUNI landline telecommunications providers for all cities in the US from 1999 through 2002. We consider only those CLECs and MUNIs that offer fixed-line residential telecommunications services to the public. The comprehensive geographic coverage of the data set allows for a thorough study of the effect of government competition on private sector companies, using the behavior of private firms in the US telecommunications industry.

Our primary finding is that in the US telecommunications industry, the presence of a municipal provider is positively correlated with the city's having no new private providers. This may indicate that municipal providers choose to operate in cities with inadequate telecommunication service choices in order to serve unmet demand. This result differs from a prior analysis by Hauge et al. (2008), in which the authors found no effect of municipal provision on CLEC provision.[6] We do not address the important policy questions concerning the effects of municipal provision of telecommunications on ILECs, customers, or taxpayers.

2 Review of Relevant Literature

Government's proper role in providing essential services has been of concern since the nineteenth century, when governments began to suggest that private provision of services deemed to be essential was inadequate. For example, Matthews (1991) analyzed the role of the British government's regulation of municipal and private provision of natural gas during the Victorian period. Klein (1990) examined the dichotomy of competition and regulation in the US railroad industry. Work by Cremer et al. (1991) illustrates that public provision of an essential service may be suboptimal even under conditions in which the provider's goal is to maximize social welfare. Lott (1990) also concluded that public provision may reduce social welfare. Finally, a study by De Fraja and Delbono (1989) finds that in a competitive market, it is socially better for a public firm to try to maximize profit rather than to pursue a goal of social welfare. They show that while a private entrant should prefer no public competition, if there

[4] The term ILEC refers to telephone companies that existed at the breakup of AT&T in 1984, and that were providing local telecommunications services when the Telecommunications Act of 1996 was passed.

[5] Services supplied by MUNIs include those used for the city's own operations (meter reading, municipal data network, supervisory control and data acquisition, and voice) and those provided as retail services to others (cable television, long distance telephone, Internet access, broadband, fiber leasing, and local telephone). MUNI data is from the APPA. CLEC data is primarily from the annual CLEC Reports from New Paradigm Resources Group, Inc., and includes both planned and operational voice and data network services provided by CLECs. Our empirical analysis focuses on operational voice services.

[6] Hauge et al. (2008) address this question using the model put forward by Greenstein and Mazzeo (2006); however, Hauge et al. (2008) do not segregate the data (as described in detail below). We believe this results in inaccurate estimates as suggested by an anonymous referee. Therefore, we re-design this study and estimate a model that we believe more correctly reflects the effect of municipal providers on private entrants.

is to be a public competitor, it is beneficial to the entrant if the public provider enters the market first.

More current analyses considering the co-existence of public and private provision of public utilities include an analysis by Sappington and Sidak (2003), in which the authors found that government-owned enterprises may have greater incentives to create barriers to entry than do private firms. Other related studies consider that there may be goods or services that are more appropriately provided by public operations than other goods or services would be. For example, Shleifer (1998) considers state versus private ownership and the parameters under which each type of ownership might be appropriate. Along these lines, Hart et al. (1997) make the argument that some services are more effectively provided by the state (for example police and prisons), while other services are more effectively provided privately (for example garbage collection and weapons production).

A related research focus considers the propensity of municipal electricity providers to offer telecommunications services. As is shown in our data, almost every municipal telecommunications provider also offers municipal electric services; however, this correlation does not hold in reverse. Gillett et al. (2006) found that in 2003, only approximately one quarter of municipalities offering electric provided some type of communications service. Their study found that municipal electric providers in metropolitan areas and in markets with limited cable modem and DSL services were more likely also to offer telecommunications services. The results of their analysis correspond with our findings with respect to municipal telecommunications providers responding to competitive alternatives. To our knowledge, however, the Gillett et al. (2006) study is the only related paper that addresses the role of electricity provision on municipal telecommunications provision.

A number of papers have focused specifically on entry in local telecommunications markets. A study by Zolnierek et al. (2001) considers the market entry patterns of CLECs following passage of the 1996 Telecommunications Act. The study focuses on the characteristics of markets into which CLECs enter and finds that CLECs enter more highly populated areas and areas dominated by the former Regional Bell Operating Companies. The paper also includes regulatory characteristics that can affect entry. Edwards and Waverman (2006) also show that regulatory characteristics can affect entry, by showing that European national regulatory authorities have a greater tendency to favor ILECs in issues related to competition when the providers are at least partially government owned.

Alexander and Feinberg (2004) follow Zolnierek et al. (2001), by examining the determinants of entry and the role of regulatory policies following the 1996 Telecommunications Act. They find that market size is a primary driver of entry. Additionally, they augment the set of regulatory variables used by Zolnierek et al. (2001) in order to obtain a more definitive result with respect to regulatory characteristics' effect on entry. Roycroft (2005) performs a similar study on a limited geographic area: the territory served by telecommunications provider SBC in California. However, Roycroft (2005) uses a different measure of geographic market boundaries and a different measure of regulatory influence than we use in our estimations.

Related studies focus on the manner of entry. For example, Jamison (2004) finds that when regulators require incumbents to charge lower prices for unbundled network

elements relative to their costs, incumbents act to limit CLEC entry by delaying negotiations with CLECs or making implementation of interconnection service difficult.[7] Other studies find that CLECs building their own networks are more successful than are those that do not build but instead lease lines from the incumbent (Foreman 2002). Greenstein and Mazzeo (2006) examine CLEC entry, focusing on the variety of services offered by CLECs. They argue that all CLECs are not equal, and that CLECs attempt to differentiate themselves within a given geographic area so as to dominate a particular aspect of the market. We draw on the model presented in Greenstein and Mazzeo (2006) in formulating our empirical analysis.

Existing literature on CLEC entry largely ignores the issue of municipal competition. Therefore, while our paper is similar to some prior research, it differs in that it addresses the municipal provision of local telecommunications services alongside CLEC and ILEC provision. We incorporate many of the same variables used in prior studies; our addition to the literature is to assess the impact (if any) that the existence of a municipal telecommunications provider has on market structure. This also allows us to shed some light on the broader question of how municipal provision of a particular private good affects private provision of that good.[8]

3 Methodology

A standard theoretical analysis of entry, exit, and competition in markets in the industrial organization literature follows the work of Bresnahan and Reiss (1991). In this theoretical framework, firms are assumed to make entry and exit decisions based on market factors that influence profit opportunities. Using a game-theoretic model of firm behavior, this framework supports an empirical methodology that allows statistical inferences to be made from observed market structure. Greenstein and Mazzeo (2006) utilize this framework to analyze the US telecommunications market, concentrating on the issue of differentiation among competing CLECs. Our theoretical and empirical analysis follows that of Greenstein and Mazzeo (2006) by measuring CLEC and MUNI presence in a market, and adds to this literature by including the effect of municipal telecommunications provision on private competition.

Following the literature, we define a profit function for the telecommunications market in each city i:

$$\pi_i = \beta x_i + \gamma c_i + \delta r_i + \theta n_i + \varepsilon_i, \tag{1}$$

where x_i is a vector of demand characteristics, c_i is a vector of cost characteristics, r_i is a vector of regulatory characteristics, and n_i represents the number of CLECs in city i. The vector β, the vector γ, the vector δ, and the scalar θ represent parameters

[7] Unbundled network elements are portions of an incumbent's network that CLECs are allowed to lease and use for providing service in competition with the incumbent.

[8] In earlier research we utilize a similar database to consider municipal competition. Although econometrically different from the current models used, the earlier models provide background for the current paper. See Hauge et al. (2008).

to be estimated, and ε_i is a random error term that incorporates all factors that are unobservable to the researcher.

We assume that a greater number of CLECs is associated with lower profit per CLEC: i.e., profit is decreasing in n ($\partial\pi/\partial n = \theta < 0$). CLEC provision occurs until the $n+1$th firm expects profits to be less than zero in this market and therefore does not serve the market. Thus, in each city, the observed market structure of n CLECs implies the following inequalities:

$$\begin{aligned} \pi_i &= \beta x_i + \gamma c_i + \delta r_i + \theta n_i + \varepsilon_i \geq 0, \quad \text{and} \\ \pi_i &= \beta x_i + \gamma c_i + \delta r_i + \theta(n_i + 1) + \varepsilon_i < 0. \end{aligned} \tag{2}$$

Although the parameters of Eq. 1 cannot be directly estimated without information on firm-level profits, the parameters can be inferred by maximizing the likelihood that the inequalities in Eq. 2 hold in a cross-section of cities. The estimated parameters would then indicate the relative importance of demand characteristics, cost characteristics, and regulatory characteristics on market structure in terms of the number of CLECs that are present. This empirical model reduces to an ordered, limited-dependent variable estimation, where the dependent variable is the number of CLECs in the city. Assuming that ε_i follows a normal distribution, the relative importance of demand, cost, and regulatory characteristics can be estimated with an ordered probit model.

As dictated by the model, CLEC provision will be influenced by demand considerations, cost considerations, and the regulatory environment. The vector x_i includes city-level socioeconomic measures that influence telecommunications demand. Because penetration rates for landline telecommunications services were approximately 97% within the US during the years of our study, it is difficult to predict the factors that potential competitors considered when analyzing the level of demand needed to ensure profitability. We use those variables that prior studies estimating demand have found to be significant (see Garbacz and Thompson 2002, 2003, and Grzybowski 2005). The demand measures are based on the 2000 Census, are at the city level, and are constant over time (US Census Bureau 2007).

As in any model of demand, an increase in potential customers should increase the demand for telecommunications services. We measure the potential market base using the natural log of total population (*population*). We expect demand to be positively related to household income, and we measure this factor using the natural log of median household income (*income*). Because the age of potential customers may affect demand, we include the median age of the population of each city (*age*).[9]

The vector c_i includes city-level measures of the cost of telecommunication services. Following the 1996 Act, ILECs are required to provide unbundled network elements to rivals. If an ILEC finds it more profitable to provide retail services than to provide unbundled network elements, we would expect the ILEC to try to limit competitors. To capture this effect, we include the ratio of ILEC revenue per line to

[9] We considered additional population characteristics such as race and ethnicity, language, and other measures of population density, such as urban classifications, and various demographic indicators such as the employment growth rate and personal bankruptcy rate. These variables proved to be insignificant and did not affect the results, so they have been excluded from the estimates presented in this paper.

the price charged for unbundled network elements (*profit*). The variable *profit*, which is constant over time, is measured at the state level and reflects both the competitive and the regulatory environment.[10] If an ILEC is able to inhibit CLEC provision, we expect the coefficient on profit to be negative; however, it is also possible that an area that is profitable for an ILEC will be profitable for the CLEC also. The latter case would occur if demand characteristics drive entry.

The vector r_i contains information on the regulatory environment. These variables are measured at the state level and are constant over time. State regulatory agencies influence the profitability of CLECs by setting standards for pricing and competitive relationships. We expect flexible regulation for CLECs to decrease the probability of CLEC presence due to an uncertain regulatory environment.[11] We measure this effect with the variable *flexible regulation* (excluded category = all other types of regulation). Finally, we include a series of dummy variables to indicate the ILEC operating in each city. The ease with which a CLEC can interconnect with an ILEC varies substantially by ILEC (Mini 2001).[12]

The profit function represented in Eq. 1 does not include the potential impact of a municipal telecommunications provider. Similar to the existence of other CLECs, a MUNI will increase the competitive environment and lower profit opportunities. However, MUNIs may not compete with CLECs in the same fashion as do other CLECs. Specifically, MUNIs may not exhibit the same profit maximizing behavior as do CLECs, and MUNIs may have cost advantages based on sources of public funding. Thus, from the vantage point of a CLEC that is contemplating serving a market, competition from a MUNI cannot be modeled in the same way as competition from another CLEC. If we assume that the existence of a MUNI undercuts the profit opportunities for all potential telecommunications providers, than the profit function of Eq. 1 can be modified to the following:

[10] Leasing portions of an incumbent's network is called "purchasing unbundled network elements." For example, a CLEC could lease a local telephone line from the incumbent provider. The line would connect to the incumbent's building. It could then connect to the incumbent's switch or the entrant's switch, depending on how the entrant wishes to use the incumbent's facilities. Our variable is a statewide average based on the loop, port, and switching rates per month. For our purposes, it is not necessary further to distinguish facilities-based providers from those who enter the market by leasing or purchasing lines. This is because the options are available to all potential CLECs and municipal entrants indiscriminately, ensuring even competition in this respect. We do acknowledge that municipalities frequently have their own limited facilities by virtue of being electricity providers or through their connections with other local government agencies such as police and fire services. These facilities are part of the advantage over CLECs that generate concern among those believing that municipalities should not be permitted to compete.

[11] In contrast, an incentive-based regulatory scheme such as price-cap regulation might encourage additional competitors to enter the market due to the possibility of earning above normal profits.

[12] In other specifications we incorporate ILEC regulatory flexibility including the regulatory scheme (such as price cap and rate of return); inclusion of these variables was inconsequential and therefore, is omitted in our current model. The coefficients on the ILEC dummy variables are excluded from the tables in this paper for brevity. All results are available upon request.

$$\pi_i = \alpha \mathrm{MUNI}_i + \beta x_i + \gamma c_i + \delta r_i + \theta n_i + \varepsilon_i, \tag{3}$$

where α measures the decrease in expected profits that is associated with the presence of a MUNI.[13]

We assume that the existence or non-existence of a MUNI is taken as given by a CLEC. Thus, the observed market structure in each city can be used to infer the parameters of the profit function. In addition, observed differences in market structures over cities with and without MUNIs allow for the estimation of α. The observed market structure of n CLECs implies the following inequalities:

$$\begin{aligned} \pi_i &= \alpha muni_i + \beta x_i + \gamma c_i + \delta r_i + \theta n_i + \varepsilon_i \geq 0, \quad \text{and} \\ \pi_i &= \alpha muni_i + \beta x_i + \gamma c_i + \delta r_i + \theta (n_i + 1) + \varepsilon_i < 0, \end{aligned} \tag{4}$$

where $muni_i = 1$ if a municipal provider exists in city i and $muni_i = 0$ otherwise. As above, if ε_i follows a normal distribution, then Eqs. 3 and 4 imply that the relative importance of demand, cost, and regulatory characteristics can be estimated using ordered probit on a cross-section of cities, where the dependent variable is the number of CLECs per city.

Although this paper is most interested in CLEC behavior in the presence of a MUNI, the issue of municipal telecommunications provision also must be addressed. A MUNI is assumed to serve a city based on the demand for municipal provision of telecommunications services and the cost of providing such services. However, a MUNI may not be required to maximize profits, and a MUNI may have advantages over a CLEC in terms of lower costs.

Because the presence or non-presence of CLECs in a given city may influence the MUNI's decision to offer telecommunications services, we recognize that the MUNI presence decision may be endogenous; we therefore use a two stage approach, and being with assuming the following equation defining a pseudo-profit function for the municipal provision of telecommunications in each city i:

$$\Pi_i = \mathrm{B} X_i + \Gamma C_i + \mathrm{E}_i, \tag{5}$$

where X_i is a vector of demand characteristics, and C_i is a vector of cost characteristics. The vectors B and Γ are parameters to be estimated, and E_i is a random error term that incorporates all factors that are unobservable to the researcher. The following rule determines MUNI provision:

$$muni_i = 1 \quad \text{if and only if } \Pi_i \geq 0. \tag{6}$$

Assuming that E_i follows a normal distribution, the parameters of Eq. 5 can be estimated with a probit estimation.

[13] Equation (3) implies that MUNI enters the profit function as a shift parameter and does not interact with other determinants of potential profit. This assumption can be relaxed to allow for interactions among any or all independent variables. In our data, there is no evidence that any of the variables interact in a way that is both statistically and economically significant.

Notice that the X_i vector in Eq. 5 should be identical to the x_i vector of Eq. 3, so that the demand factors affecting MUNI pseudo-profits are the same as those affecting CLEC profits. The C_i vector contains information on the cost of public provision of telecommunication services. MUNIs may have distinct advantages with respect to cost since many (over 90% in the current sample) also provide electricity to their residents. There exist potential savings with respect to marketing, administration, billing, customer service, and even the provision of telecommunications since municipal electric providers must have telecommunications services to essential city services such as police and fire departments already. Therefore, as a proxy for cost information, we use the variable *electric*, which indicates whether the municipal provider also provides electricity to residents.

The unobservable nature of some determinants of the decisions of MUNIs and CLECs may lead to biased estimates of market structure.[14] Specifically, the error terms of Eqs. 3 and 5 are likely to be correlated, since unobservable characteristics captured in ε_i are also captured in E_i, leading to a biased estimate of α. This type of endogeneity bias can be corrected in a two-stage process, similar to two-stage least squares. In the case of MUNI and CLEC entry, the endogeneity bias can be overcome by estimating the decision to serve a market of a MUNI (using probit as discussed above) and using the parameters to predict the probability of MUNI provision for each city. The predicted probability of MUNI provision is then used in the ordered probit of market structure. The resulting α coefficient is then purged of endogeneity bias.[15]

4 Data

We test the hypothesis that the existence of a MUNI impacts CLEC provision of telecommunications services due to potentially reduced profit opportunities. The basic data set includes observations on all US cities for each of the four years from 1999 to 2002. We employ data from New Paradigm Resources Group, which also are used by Greenstein and Mazzeo (2006). In the spirit of Greenstein and Mazzeo (2006), we use a subset of these data.

In order to concentrate on those cities that have sufficient demand to support competitive telecommunications firms, we concentrate on those cities that had a municipal provider and/or at least one CLEC at some point over the 4-year time period.[16] Further, we drop cities with saturated telecommunication markets (>10 CLECs). Finally, we drop a

[14] The assumption of independence between the decision of a MUNI to provide telecommunications services and CLEC existence is made for ease of exposition. The assumption merely allows one to interpret Eq. 5 as a structural, rather than a reduced-form, equation. The estimates of telecommunications market structure are not affected by this assumption.

[15] It is necessary to identify the MUNI provision decision from the CLEC decision. Here, this is accomplished through the inclusion of *electric* in the MUNI decision equation and excluding *electric* from the CLEC decision equation. Unfortunately, the validity of the exclusion restriction cannot be tested since the system is exactly identified.

[16] City data is from Zip-List5, CD Light, LLC, 230 N Tranquil Path Dr., The Woodlands, TX 77380. Data includes every city/county pair within the US. This results in a number of potential duplications as a city may span two or more counties. In our models, such duplications are omitted to ensure more accurate estimations.

Table 1 MUNIs in cities with and without CLECs

		Cities with CLECs	Cities without CLECs	Total
	1999			
	muni = yes	19	173	192
	muni = no	297	938	1,235
	Total	316	1,111	**1,427**
	2000			
	muni = yes	92	233	325
	muni = no	1,102	0	1,102
	Total	1,194	233	**1,427**
	2001			
	muni = yes	76	258	334
	muni = no	518	575	1,093
	Total	594	833	**1,427**
	2002			
	muni = yes	74	268	342
	muni = no	469	616	1,085
Total observations 1,427 per year	Total	543	884	**1,427**

few small cities (population <100) and a few very large cities (population > 500,000) that are outliers in the data set. The resulting data set contains observations on 1,427 cities for each of four years, for a total of 5,708 observations. This sample is larger than that of Greenstein and Mazzeo 2006 ($n = 1,119$ per year), but our sample represents a similar population. In addition, our data differ from those used by Greenstein and Mazzeo since we use four years of data and they use two years (1999 and 2002).

Table 1 summarizes the relationship between cities with and without MUNIs and with and without CLECs over the sample time period. Table 1 illustrates several interesting trends. First, the number of cities with CLECs increased from 1999 to 2002. Second, the number of cities with CLECs increased dramatically from 1999 to 2000 (almost 300%), then decreased by approximately 50% from 2000 to 2001, and then slightly decreased again from 2001 to 2002 (9%). Third, the number of cities with MUNIs increased every year from 1999 to 2002. We submit that the spike in cities with CLECs in 2000 and the continuous upward trend in MUNIs are not indicative of a causal relationship between CLEC and MUNI provision. Furthermore, there was a general upward trend in the percentage of cities in which both CLECs and a MUNI were located, from 19 cities (1%) in 1999 to 74 cities (5%) in 2002.

The initial increase in CLECs is most likely related to regulators settling interconnection and UNE policies. Additionally, this time period has been referred to as the "dot com boom," when capital was readily available for technological pursuits. The subsequent drop in that boom may explain the relatively large fall in CLEC providers. Thus, an initial inspection of the data indicates a general positive trend in both CLEC and MUNI provision, which does not suggest an obvious negative relationship between MUNI and CLEC existence in a market.

Table 2 Summary statistics per city

Variables	Description	Source	Mean (standard deviation)	Minimum (Maximum)
clec	Number of CLECs that provide telecom per city	New Paradigm Resources Group	0.792 (1.282)	0 (10)
muni	Equals 1 if MUNI provides telecom in city	State legislative websites	0.209 (0.407)	0 (1)
profit	ILEC revenue per line/UNE price	Public Service Commission of West Virginia; Federal Communications Commission	1.543 (0.413)	0.74 (2.64)
flexible regulation	Equals 1 if state-level regulation is flexible	State Telephone Regulation Report, Warren News	0.564 (0.496)	0 (1)
population	Natural log of total city population	US Census Bureau	9.861 (1.343)	4.94 (13.04)
income	Natural log of median household income in city	US Census Bureau	10.60 (0.336)	9.50 (12.03)
age	Median age in city	US Census Bureau	35.65 (5.760)	18.50 (72.20)
electric	Equals 1 if muni provides electric in city (2004)	American Public Power Association	0.306 (0.461)	0 (1)

All years combined N = 5,708

Table 2 provides summary statistics of the variables incorporated in our model. A cursory look at the remaining data does little to suggest a clear or typical pattern of provision. As shown in Appendix B, the average population, median income, and average age found in cities with municipalities is slightly lower than in cities with CLECs, but the differences are not statistically significant. With respect to average population, municipalities have become telecommunications providers in cities as small as Kokhanok, AK (population 178), and as large as Mesa, AZ (population 397,215). They have become telecommunications providers in seven cities with median household income less than $20,000 per year and in eight cities with median household income greater than $75,000 per year. Municipal providers also have served 16 markets in which the average age is <25. Of these, nine are primarily composed of college students, and three are in Utah where the state median age is 27.1.

5 Results

We evaluate the effect of municipal provision on market structure employing the empirical methodology discussed in Sect. 3. Specifically, we estimate a first-stage

Table 3 Ordered probit estimations

Variables	1999	2000	2001	2002
	n = 1,427	n = 1,427	n = 1,427	n = 1,427
muni	−0.8981***	−1.9326***	−0.5250***	−0.4294***
	(0.2601)	(0.1482)	(0.1184)	(0.1123)
profit	0.1714	−0.0190	−0.0314	−0.0239
	(0.1242)	(0.0890)	(0.0978)	(0.0899)
flexible regulation	−0.4240***	−0.1501**	−0.1341*	−0.2234***
	(0.0784)	(0.0719)	(0.0716)	(0.0716)
population	0.4661***	0.5973***	0.5509***	0.5958***
	(0.0499)	(0.0378)	(0.0386)	(0.0379)
income	0.1673	−0.0978	0.2125*	0.0027
	(0.1229)	(0.1013)	(0.1139)	(0.1179)
age	−0.0015	0.0066	−0.0055	0.0012
	(0.0081)	(0.0056)	(0.0067)	(0.0067)
ILEC chi^2 statistic(9)	7.72	33.58***	74.58***	43.18***
pseudo R^2	0.131	0.234	0.145	0.150

Dependent variable = Number of CLECs per city (bootstrapped standard errors in parentheses)
* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level
Notes: Dummy variables for individual ILECs are included in these regressions, but the coefficients are not shown in the table. Ordered probit also estimates an intercept for each outcome, which are excluded from the table for brevity

probit of MUNI existence (implied by Eqs. 5 and 6) and create the predicted probability of municipal provision.[17] Next, we estimate a second-stage, ordered probit of market structure (as implied by Eqs. 3 and 4 for each yearly cross-section,[18] substituting the predicted probability of municipal provision for the independent variable *muni*. The resulting coefficients from the second-stage estimations are reported in Table 3. Note that the inclusion of a predicted value for *muni* makes the traditional standard errors questionable. Instead, we report bootstrapped standard errors for the coefficients.[19]

Table 3 indicates that the existence of a municipal provider was negatively related to the number of CLECs in a city during the years of our analysis. Thus, we assert that the existence of a MUNI is expected to lower the probability of CLEC presence. Due to the non-linear nature of ordered probit, the coefficients in Table 3 cannot be

[17] The results from the first-stage probit are listed in Appendix A. Discussion of these results is excluded for brevity; however, a complete analysis of the first stage is available upon request. A Hausman test (also available upon request) shows that *muni* is endogenous to CLEC presence.

[18] A Chow test indicates that the yearly data are drawn from significantly different samples at the 1% level (chi^2 statistic (24) = 1,457.3).

[19] The standard errors are produced by bootstrapping the entire estimation (first and second stages) using 1,000 replications. The bootstrapping procedure is programmed in STATA (2007) version 10.1 and is available upon request.

interpreted as marginal effects; however, based on these coefficients, marginal effects can be evaluated at the sample means. Also due to the non-linear nature of ordered probit, the marginal effects will differ depending on the outcome under consideration. Specifically, the marginal effect of *muni* on the number of CLECs in a city will vary depending on the number of CLECs that exist. Furthermore, the marginal effects will differ by year.

For 2002, the estimated marginal effects of *muni* on the number of CLECs are the following: for the first potential CLEC, the probability of being present in a given city is 11% points lower for cities with a municipal provider; for the second possible CLEC, the probability is three percentage points lower; for the third, one point lower; for the fourth, 0.5 points lower; and for the fifth, 0.2 points lower. The 2002 marginal effects of *muni* for additional CLECs are not significantly different from zero. The pattern of estimated marginal effects for other years is similar. Thus, the existence of a municipal telecommunications provider does inhibit CLEC presence in our sample, but the effect only appears to be economically significant for the first CLEC. In cities that are profitable enough for the first CLEC to operate, the negative effect of a MUNI falls substantially for subsequent CLECs.[20]

Table 3 also indicates that *profit* is insignificantly correlated with CLEC presence for all 4 years. The coefficient on the variable representing the type of regulation within the state (*flexible regulation*) is negative and significant for all years. As suggested above, this is most likely due to the uncertainty of profitability that accompanies a flexible regulatory scheme and the lack of an incentive regulation scheme that would allow above-normal profits for efficient providers.

Population is positive and significant, as expected since CLECs are more likely to exist in a market that has more inhabitants and therefore, greater demand for telecommunications services. Also, CLEC presence is positively correlated with *income* in 2001; this is not surprising since higher-income-earning consumers have additional income that they may be willing to spend on such new technologies and services.

6 Conclusion

The results presented in this paper suggest a negative correlation between municipal provision of telecommunications services and CLEC provision. However, the size of this negative relationship appears to be economically relevant only for the

[20] One could argue that municipalities that offer electric service constrain current CLEC entry even in the absence of municipal telecommunications provision, since those cities are more likely than others to offer telecommunications services in the future. To shed light on this issue, we estimated CLEC entry models for each year using the sub-sample of 437 cities that offer electric service. The results indicate that municipal telecommunications provision is still shown to be significantly and negatively correlated with CLEC entry for all years except 1999, for which the estimated coefficient is negative and insignificant. Further, the estimated marginal effects for 2002 are only slightly smaller than those for the entire sample: first CLEC, −10.4%; second CLEC, −2%; third CLEC, −0.3%; fourth CLEC, −0.2%; and fifth CLEC, −0.1%. Thus, the implication for municipal provision is similar with this sub-sample as compared to estimates with the entire sample (1999 being the exception): specifically, municipal provision of telecommunications services appears to hinder only the primary CLEC entrant in any meaningful way.

initial CLEC serving a given market. Furthermore, the municipal telecommunications provider serves as the only provider (other than the ILEC) in a number of cities (over 16% of the sample). This may indicate that municipal providers are satisfying unmet demand in a market that is unprofitable for a private provider. Alternatively, it may suggest that municipalities limit CLEC entry into some profitable markets.

Determining which of these implications is correct is important for public policy. Specifically, satisfying unmet demand may be socially optimal (as Hart et al. (1997) found with respect to police forces); alternatively, potentially crowding out private investment is socially undesirable. In addition, further research is needed to determine the social welfare implications of municipal telecommunications provision.

We also find that socioeconomic characteristics and the regulatory environment affect CLEC presence in a market. The study, however, was undertaken during a time in which market conditions were changing. In particular, regulatory authorities were settling interconnection and unbundled network element issues, while capital was being infused into the industry at a rapid rate. It is likely this provided an incentive to CLECs to expand into areas they otherwise might not have. Consequently, when the capital infusion subsided, many of these CLECs were no longer profitable. Municipalities, on the other hand, should have been less affected by those forces that determine CLEC entry decisions. Hence, municipal telecommunications providers may have obtained an advantage by not operating wholly within the competitive market.

The time period of the study has some benefits: it follows the Telecommunications Act of 1996, which was designed to promote CLEC entry, and ends prior to the Supreme Court decision allowing states to restrict municipal provision. The significant amount of associated relevant market activity within the time period should cause us to view these results with some caution.

In sum, this study represents an initial step in a more thorough analysis of US municipal telecommunications provision. To analyze more comprehensively the possibility of crowding out, this research might be extended to incorporate effects on prices and investment. Based on these results, one could pursue theoretical research regarding the relative efficiency of private versus public entities. An important further step is to consider who (the municipal provider, the municipality's citizens, or someone else) absorbs the commercial risk when the city becomes a telecommunications provider. Cities have claimed they do not need the high rates of return that private companies need in order to justify their investment. Considering revenues, prices, and municipal funding of telecommunications investments should allow researchers to answer empirically the question of whether public or private telecommunications entities are better able to manage risk.

Acknowledgements We are grateful to Rich Gentry, Larry White, participants at the University of Florida/London Business School "Future of Broadband" conference, and two anonymous referees for helpful comments and suggestions. We thank the New Paradigm Resources Group, the American Public Power Association, and the West Virginia Public Service Commission for providing data.

Appendix A

See Table 4.

Table 4 First-stage probit estimation: dependent variable = *muni*

Variables	1999–2002 n = 5,708
electric	3.4008*** (0.1179)
population	−0.0509 (0.0507)
population*2000	−0.1494** (0.0722)
population*2001	−0.0172 (0.0714)
population*2002	0.0458 (0.0712)
income	−0.6349*** (0.2327)
income*2000	−0.2416 (0.3209)
income*2001	0.0011 (0.3174)
income*2002	−0.0222 (0.3179)
age	−0.0102 (0.0125)
age*2000	0.0202 (0.0181)
age*2001	0.0044 (0.0179)
age*2002	−0.0036 (0.0181)
2000	4.0875 (3.2823)
2001	0.8828 (3.2362)
2002	0.8612 (3.2492)
constant	3.8637* (2.3694)
ILEC chi^2 statistic(9)	25.96***
pseudo R^2	0.644

Standard errors in parentheses
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level
Note: Yearly interaction effects are significant at the 1% level (Chi^2 statistic (12) = 167.75)

Appendix B

See Tables 5, 6, 7.

Table 5 Characteristics of cities with a municipal telecom provider: summary characteristics

Characteristic	Mean	Std. Dev.	Min.	Max.
Average population	27.299.92	43.452.87	178.00	397.215.00
Average median income	36.375.28	13.461.04	13,279.00	167.458.00
Average median age	35.89	5.45	18.50**	53.50
Electric provision also	98.89	0.10	0.00**	1.00

Total observations: 361 (in 44 states)
* Low numbers found in Alaska, and College Station, TX. ** Four providers do not offer electric

Table 6 Characteristics of cities with a municipal telecom provider: population detail

State	City	Population
Populations below 500 people		
AK	Kokhanok	178
AK	White Mountain	210
AK	Chefornak	355
MO	Newburg	454
SD	Faith	480
Population above 150.000 People		
CA	Modesto	189,460
WA	Tacoma	193,177
CA	Glendale	195,047
TX	Lubbock	199,556
TX	Garland	215,991
CA	Riverside	255,093
AK	Anchorage	260,283
AZ	Mesa	397,215

Total observations: 361 (in 44 states)

Table 7 Characteristics of cities with a municipal telecom provider: median income detail

State	City	Median Income
Median income below $20.000		
KY	Barbourville	13,297
KY	Monticello	17,423
MO	Newburg	18,000
TN	Lafollette	18,370
AK	Kokhanok	19,583
GA	Fort Valley	19,646
MO	Unionville	19,979

Table 7 continued

State	City	Median Income
Median income above $75,000		
MA	Reading	77,059
IL	Geneva	77,299
MA	Belmont	80,295
MA	Hingham	86,574
IL	Naperville	88,771
CA	Palo Alto	90,377
MA	Wellesley	113,686
IL	Winnetka[a]	167,458

Total observations: 361 (in 44 states)

[a] In 2007, Winnetka had the 4th highest average household income in the country (CNN Money)

Appendix C

See Table 8.

Table 8 Matrix of correlation coefficients

	clec	muni	profit	flex reg	population	income	age	electric
clec	1.000							
muni	−0.160	1.000						
profit	−0.007	0.032	1.000					
flex reg	−0.062	0.043	0.186	1.000				
population	0.402	−0.210	−0.010	0.045	1.000			
income	0.035	−0.240	0.072	0.027	0.133	1.000		
age	−0.115	0.016	−0.005	0.016	−0.298	0.184	1.000	
electric	−0.159	0.763	0.043	0.051	−0.215	−0.245	0.010	1.000

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EXHIBIT C

SPECIAL REPORT

ANALYSIS OF ECONOMICS OF HIGH SPEED INTERNET ACCESS IN RURAL AREAS

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July 5, 2007

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QUALIFICATIONS OF THE ANALYST

John Mansell, Jr. is President of John Mansell Associates, Inc. He was previously with Kagan Research, LLC nearly from its inception over 35 years ago. He began his career as a newsletter editor in 1975 and was promoted to senior analyst in 1986. Mr. Mansell was Kagan's lead analyst for cable TV overbuilds and competition, sports media rights and franchise valuations, communications law, and a seasoned appraiser of sports business, digital media, wireless, DBS and communications properties. He was responsible for writing, editing and contributing to several Kagan books, special reports and newsletters, including Kagan's *Wireless Broadband, Cable TV Law Reporter* and *Media Sports Business.* Mr. Mansell served as moderator at Kagan events such as the Kagan Digital Media Summit and has been invited to speak at industry association conferences, including the Wireless Communications Assn., National Cable TV & Telecom Assn. and the Western Cable Show.

Mr. Mansell has a B.A. in economics from the University of Michigan, 1974, received his J.D. degree in 1978 from Thomas M. Cooley Law School and is a member of the Michigan Bar, District of Columbia Bar and Federal Communications Bar Association.

EXECUTIVE SUMMARY AND CONCLUSION

ANALYSIS OF ECONOMICS OF HIGH SPEED INTERNET ACCESS IN RURAL AREAS

We have been asked to analyze the economic feasibility of constructing wireline broadband networks in rural areas of 5,000, 10,000 and 15,000 homes where two or more incumbent wireline providers already provide service. Our report contains a number of discounted cash flow models with varying assumptions to ascertain whether the building of an additional wireline broadband network is sustainable in rural communities.

Washington policymakers have set a goal of bringing broadband to all Americans. To achieve this goal, the U.S. Department of Agriculture's Rural Development Broadband Access and Telecommunications Program grants loans to companies that seek to offer broadband to unserved and underserved communities. John Mansell Associates (JMA) has been asked to assess the government loan repayment by wireline broadband providers in communities where two or more companies already provide service. JMA tested a series of models under varying assumptions to ascertain whether the new entrant would be able to repay its government loan.

The construction and ongoing operation of a broadband network is a very expensive undertaking. The associated costs tend to be even greater in rural communities because of lower population density, remoteness, and rugged terrain. High upfront construction and operating costs, plus existing and future competition, make it highly unlikely that a wireline broadband provider that enters a market where there are two or more incumbent providers will be able to survive for more than a few years

In order to determine the feasibility of a broadband network, JMA uses the industry standard of discounted cash flow models. Our discounted cash flow models made a range of assumptions concerning the take rates for service, from very conservative to overly optimistic. We analyzed both fiber-to-the-home (FTTH) and hybrid fiber coax (HFC) construction. In some

of our models, we assumed that the triple play of video, high-speed data and voice services would be provided. In others, we assumed that data/voice or only high-speed data would be offered.

In each of the scenarios we evaluated, in which a third wireline broadband provider enters a rural market, the USDA loans will not be paid back. In the case of a new entrant to a market planning to offer voice, data and video via either a hybrid fiber coax network or a fiber-to-the-home architecture, debt repayment is impossible because of high upfront capital expenditures and a lack of free cash flow. When the new entrant offers only voice and data services, losses declined 3-6% for the 5,000-home systems, but increased for the 10,000 and 15,000-home systems due mainly to higher upfront capital costs. When only data was offered, cash flow losses increased by 2% to 75% across the board.

In our "Triple Play" model (multichannel video + high-speed data + VoIP), we assumed 30% of a new entrant's homes would subscribe to video and high-speed data and 25% would take voice service. Although average revenue per unit (ARPU) climbed from $105 in Year 1 to $145 in Year 10, cumulative discounted cash flow was negative for both HFC and FTTH systems using both a 10% and 16% discount rate. Losses were higher when only data and voice service were offered and higher still when only high-speed data was available.

In two other sets of models, we also analyzed the economic feasibility of constructing wireline broadband networks in rural areas of 5,000 homes where there is *no other wireline provider of high-speed Internet access.*

In one of those sets of models, we assumed that the incumbent local exchange carrier would be the provider and would initiate high-speed access and multichannel video while retaining legacy phone service, or would simply offer high-speed access without offering video service. As in earlier models, we analyzed both HFC and FTTH construction. In each scenario,

the positive net present value of the discounted cash flow indicated that a USDA loan *could be* repaid.

In the other set of models - where there is no other wireline broadband provider -- we assumed a new entrant to the market would provide either the "Triple Play" or only VoIP + high-speed data. Under this scenario, in most cases, the new entrant had positive cash flow over 10 years, indicating that a USDA loan would be repayable. Cumulative discounted cash flow was negative, however, when multichannel video service was not offered. As a result, a USDA loan would likely not be paid back by a new entrant providing only high-speed data and VoIP service, but not multichannel video.

The USDA Rural Development Broadband Access Loan and Loan Guarantee Program is intended to provide loans for the cost of construction, improvement, and acquisition of facilities and equipment for broadband services in eligible rural communities. According to a May 2007 report by the agency, *USDA Rural Development: Bringing Broadband to Rural America* (See http://www.rurdev.usda.gov/rd/pubs/RDBroadbandRpt.pdf), since its inception, 70 loans totaling over $1.22 billion have been approved for 1,263 communities with a total of 582,000 household subscribers. Approximately 40% of those communities were unserved at the time of the loan approval and 15% had only one provider. According to the report, as of April 2007, the USDA said it had received and reviewed nearly 200 applications. The approved applications were for a range of technologies--37% fiber-to-the-home, 22% DSL, 22% unlicensed wireless, 17% hybrid fiber coax, 23% fixed wireless and 1% broadband over power line. In 2006, there were 33 loan applications and the average loan was $44 million. Pending funding requests total $981 million.

Any incorporated or unincorporated area in the U.S., its territories, and insular possessions that has no more than 20,000 inhabitants, based on the most recent U.S. Census statistics, is eligible. The broadband service to be made available must enable a subscriber to transmit and receive at a rate of no less than 200 Kbps. Data transmission service must be provided and voice, graphics and video may be provided. Monies may be used for four different purposes:

- New construction and improvements;
- Broadband facilities under a capital lease (limited to 5 years and option of ownership);
- Asset acquisitions (less than 50% of requested loan amount); and
- Refinancing existing Telecom Program debt (up to 40% of requested loan amount).

The program includes several types of loans, including direct cost-of-money, direct 4% loans, and private lender guarantees. Under the loan guarantee program, the interest rate is set by the private lender. It must be fixed and the same for the guaranteed and un-guaranteed portion of the loan. Guarantees are made for no more than 80% of the amount of the principal.

Loans are made for a term equal to the expected useful life of the facilities finances, interest is payable monthly and principal payments are deferred for one year. There is no maximum loan amount except for direct 4% loans ($7.5 million). Minimum coverage, known as Times Interest Earned Ratio (TIER), is 1.25 at the end of the fifth year of the feasibility study. TIER is the ratio of an applicant's after tax net income plus interest expense, all divided by interest expense.

In order to be eligible, an entity must have 20% of the requested loan amount and cash for one full year of operating expense. For telecom companies with positive cash flow for the previous two years, this requirement can be waived. The 20% requirement may be satisfied by cash, net plant less any outstanding liens, licenses (purchase price less amortization or outstanding liens) or irrevocable letter of credit (LOC). In the case of a LOC, it must be in effect for the shorter of five years or until the borrower achieves an equity level of 20%.

HIGH SPEED INTERNET ACCESS IN RURAL AMERICA

High-speed Internet is being widely deployed in rural areas by a number of different technologies. As of June 30, 2006, the FCC has found that 99% of Americans live in the 99% of zip codes that have at least one broadband provider reporting to be serving at least one subscriber. There were high-speed broadband subscribers in 89% of the lowest populated density zip codes (those with under six persons per square mile) in 2006, up from 84% one year earlier, noted the FCC. (See, *High Speed Services for Internet Access: Status as of June 30, 2006*, Industry Analysis and Technology Division, Wireline Competition Bureau, January 2007, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270128A1.pdf). While the FCC "zip code" data is often maligned, it is a good indicator as to the trend of continued deployment.

The technologies providing broadband service in rural America include:

1) Cable modem service. Cable TV operators first began providing cable modem service in the late 1990s over hybrid-fiber coaxial networks. Cable modem service is now available to approximately 93% of households in America (See Table 14 at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270128A1.pdf). Cable companies like Mediacom, Bresnan, Buford Media and Midcontinent provide residential broadband service in thousands of rural communities all across America.

2) DSL Service. Spurred by cable modem competition, local telephone companies soon followed with digital subscriber line (DSL) service. While most residential customers receive asymmetric DSL service with download speeds of 1.5 Mbps to 3 Mbps, xDSL technology can achieve speeds of up to 8 Mbps over short distances and newer DSL technologies can support higher speeds. DSL is now available to 79% of homes in the United States where incumbent

local exchange carriers provide local phone service, according to FCC estimates. (See, *High Speed Services for Internet Access: Status as of June 30, 2006*, Industry Analysis and Technology Division, Wireline Competition Bureau, January 2007, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270128A1.pdf).

3) Satellite Broadband. This service is mainly targeted at rural customers with no cable or DSL alternatives. HughesNet offers separate monthly service charges for three levels of service, depending upon whether equipment is purchased. After nearly a decade, the service has about 500,000 residential and business customers. WildBlue, a joint venture of the National Rural Telecommunications Cooperative, Intelsat, and Liberty Media launched in June 2005, and offers three service packages. As of June 2007, WildBlue had 200,000 customers (nearly all residential), up from 120,000 at the end of 2006. The FCC's *High Speed Internet* report shows that the number of residential satellite broadband customers receiving at least 200Kbps service in one direction totaled 382,047 as of June 30, 2006, up 44.2% from a year earlier.

In June 2006, DirecTV and EchoStar announced marketing alliances with WildBlue. The deal with WildBlue allows DirecTV and EchoStar to purchase satellite broadband wholesale and resell it to customers at a price set by each company.

In addition to the WildBlue deal, the major telephone companies have DSL marketing alliances with DirecTV and EchoStar. DirecTV has relationships with BellSouth, Verizon, and Qwest. It also has a deal with ISP Earthlink. EchoStar has deals with AT&T, ALLTEL and Frontier Communications. Under EchoStar's partnership with AT&T, in areas where AT&T is not immediately deploying its terrestrial Project Lightspeed network, an integrated satellite/DSL set top is available via a single receiver manufactured by 2Wire.

TELCO/DBS VIDEO SUBS

	Q1 2007
BellSouth/DirecTV	977,000
Verizon/DirecTV	618,000
Qwest/DirecTV	506,000
AT&T/EchoStar	707,000
Total	2,808,000

Source: DirecTV and AT&T ©
John Mansell Associates, 2007

As of Q1 2006, Verizon had 618,000 customers for Verizon/DirecTV, up 48.9% from the end of 2006, BellSouth signed up 349,000 new customers for a total of 977,000, and AT&T added 216,000 in its deal with EchoStar. DirecTV reported that Qwest had 506,000 satellite video customers.

4) DBS Terrestrial High Speed Data Services. In mid-2005, DirecTV and EchoStar established a joint venture to develop a high speed access data strategy to counter the quadruple-play (voice/data/video/wireless) strategy of cable operators and phone companies. In June 2005, the venture issued a Request for Information on both the "L" band and the 2.5 GHz band (BRS/EBS). The DirecTV-EchoStar plan is to develop a network that would be partially mobile through 2009 and fully mobile after that, even at 75 miles/hour. On June 14, 2007, DirecTV and EchoStar announced that they will both resell Clearwire's (2.5 GHz) fixed wireless broadband service, and Clearwire will market DBS service.

Other entities, such as Mobile Satellite Ventures, are also developing two-way terrestrial/satellite data networks. MSV plans to launch one satellite in 2009 and another in 2010. Both are being built by Boeing.

5) Broadband Over Power Line. Broadband Over Power Line (BPL) has the potential to bring broadband Internet services to communities that do not have broadband service available today from telephone or cable companies and can provide a third broadband pipe to customers, thereby increasing competition and consumer choice.

Current Communications, operator of the largest commercial BPL network in Cincinnati,

has deployments covering 50,000 homes and is building a network to reach two million TXU customers near Dallas. Current investors include Duke Energy, EarthLink, EnerTech Capital, General Electric, Google, Goldman Sachs & Co., The Hearst Corp., and TXU Corp. The company has ongoing trials with Southern California Edison, Los Angeles Department of Water and Power, Potomac Electric Power Company and Hawaiian Electric Company.

In addition, BPL is getting much needed support from regulators in an effort to broaden the consumer choices for high-speed data. While the FCC has agreed to conduct an interference study on the technology, states are encouraging trials as an option for rural broadband.

In rural communities, these various broadband providers are either incumbent (established) or potential competitors to any company granted a USDA loan. Historically, new competitive wireline entrants, or overbuilders, often underestimate the extent to which the markets they choose are already fiercely competitive and erroneously assume they can easily and profitably capture customers from incumbent providers with lower prices. Lower promotional prices charged by new entrants are insufficient to cover costs and investment risk and are not sustainable beyond an introductory period. The four largest overbuilders--RCN, Wide Open West, Knology and Grande Communications--have all been in existence for five years or longer. Yet, their average high-speed data penetration is under 25% of homes passed and their video penetration is under 30%. It should also be noted that RCN and Knology both emerged from bankruptcy in late 2004.

DISCOUNTED CASH FLOW MODEL--TWO OR MORE INCUMBENT WIRELINE PROVIDERS

Using a set of reasonable assumptions about market demand, typical construction costs, installation expense, the price of service, subscribership, and customer churn, we created a series of 10-year discounted cash flow business models. In every case, the discounted cash flow was negative. Our models covered communities of 5,000, 10,000 and 15,000 households based on both fiber-to-the-home and hybrid fiber coax buildouts.

HEADEND FIXED COSTS

	----------Homes Passed----------		
	5,000	10,000	15,000
Video	450,000	495,000	544,500
Data	200,000	220,000	242,000
Voice	156,250	171,875	189,063
Total	806,250	886,875	975,563

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We assumed 81 homes per mile and 79% aerial construction. In the Fiber-to-the-Home (FTTH) model, the cost of construction was $72,900/mile and in the hybrid fiber coax model, the cost of construction was $37,584/mile. Headend costs were identical for FTTH and HFC installations, but varied based on homes passed. Total headend costs ranged from $806,250 (5,000 homes) to $975,563 (15,000 homes). In the models where video and/or voice were not provided, headend costs were reduced while construction (labor) and outside plant materials costs were not adjusted.

At the customer premises, drop costs were assumed to initially be $70-$76. In HFC installations, there were assumed to be 1.6 set-tops/home at a cost of $276/set-top and in FTTH homes, there were assumed to be the equivalent of two set-tops at a cost of $268/set top. Cable modems and CMTS capacity was assumed to cost $30 and $35 respectively in HFC plant with EMTA and battery backup for voice service costing $57 and $60 respectively. In FTTH plant, the Optical Network Terminal (ONT) used for voice and data was estimated to cost $500 in 2007, though the current cost is about $650 or more. We did not model IPTV, headend-in-the-sky or wireless options.

Our discounted cash flow models made a range of assumptions. In some of our models, we assumed that video, data and voice services would be provided. In others, it was assumed that data/voice or only high speed data would be offered.

When video was offered, for the sake of argument, we assumed penetration of the new entrant would rise from 10% to 30% of homes passed over time. That is an optimistic scenario. Historically, a second wireline provider seldom achieves more than 20-25% video penetration. Current overbuilders--Grande Communications, Knology and RCN--which report publicly to the SEC, all have less than 30% penetration of "marketable" homes passed after five or more years of operations. High-speed data subscribership was projected to rise from 58% of basic subscribership in Year 1 to 98% in Year 3, which is far more optimistic than current market penetration. Likewise, voice service penetration was projected to rise from 50% of basic cable subs to 85% by Year 4. This, too, is far more optimistic than current penetration levels of overbuilders.

Using a 16% discount rate, in each case, discounted free cash flow was negative after 10 years. This is so, because of the high cost of construction, headend fixed costs, and customer premises equipment/installation costs. Depending upon the type of construction and services provided, the net present value of losses ranged from $520,000 to $11.2 million over 10 years (See Table on Page 15).

Even when we reduced the discount rate to 10%, net present value was only marginally positive for the 10,000 and 15,000-home communities when data and phone service were offered. It was assumed that both services were purchased by all of a community's homes, churn was only 1.5%/mo., and the Optical Network Terminal cost a mere $50, instead of $500.

In some of our models, we assumed that video, data and voice services would be provided. In others, it was assumed that data/voice or only high speed data would be offered. When video was offered, we assumed penetration would rise from 10% to 30% over time. That is in line with the experience of wireline video competitors, both currently and historically. High-speed data subscribership was projected to rise from 58% of basic subs in Year 1 to 98% in Year 3, which is more optimistic than current market penetration. Likewise voice service penetration was expected to rise from 50% of basic cable subs to 85% by Year 4.

Our "Triple Play" model, in which video, high-speed data, and voice service was available resulted in average revenue per unit rising from $105 in Year 1 to $145 in Year 10. The cash flow margin, rising from 14% to 30% over 10 years, is consistent with past experience. Although free cash flow generally turned positive within four years, cumulative discounted free cash flow remained negative because of high up-front capital expenditures.

When only data and voice service were offered, losses declined 3-6% for the 5,000-home systems, but increased for the 10,000 and 15,000-home systems. When only data was offered, cash flow losses, increased an additional 9%-47% across the board.

DISCOUNTED CASH FLOW MODEL – NO INCUMBENT WIRELINE PROVIDERS

We also analyzed the economic feasibility of constructing wireline broadband networks in rural areas of 5,000 homes where there is no other provider of broadband data.

In one subset of models, we assumed that the incumbent local exchange carrier (ILEC) would launch broadband and multichannel video while retaining legacy phone service. Alternatively, we assumed the ILEC would offer offer only DSL broadband without offering video.

In a second subset, we assumed a new entrant to the market would provide multichannel video, VoIP and high-speed data services or only VoIP and data. Our construction cost assumptions for HFC and FTTH models were modified for headend costs depending upon whether VoIP or legacy phone service was provided.

In the absence of competition, we assumed high-speed data subscribership would rise from 53% of homes passed to 62.4% over 10 years. Where legacy voice service was retained, we assumed 90% penetration. Video penetration was projected to rise from 30% to 55% due to bundling. When VoIP was offered by an independent new entrant, we assumed penetration would rise over time from 50% of video subscribers to 85%.

In each scenario in which the incumbent telephone company was the sole wireline provider of broadband and legacy voice service, with or without multichannel video, the net present value of the discounted cash flow indicated that a USDA loan would be repaid. This was so regardless of whether the network was HFC or FTTH architecture and regardless of whether the discount rate was 10% or 16%.

When a new entrant was the sole provider of high-speed Internet access, and also provided VoIP and multichannel video, in most cases the net present value of discounted cash flow was positive, ranging from $750,000 for FTTH at a 10% discount rate to $3.36 million for HFC plant and a 10% discount rate. Such a network would be economically viable. When broadband and VoIP service were offered, but not video, however, in most cases a RUS loan would not be repaid. When broadband and voice services are offered, but not video, a rural broadband loan is less likely to be repaid.

DISCOUNTED CASH FLOW MODELS--TWO OR MORE SERVICE PROVIDERS ($mil.)

	16% Discount Rate			10% Discount Rate		
Homes Passed	5,000	10,000	15,000	5,000	10,000	15,000
Video/Data/Voice						
HFC	($1.87)	($2.98)	($4.17)	($1.50)	($2.22)	($3.03)
FTTH	($4.13)	($6.82)	($9.27)	($3.92)	($6.24)	($8.29)
Data/Voice						
HFC	($1.75)	($3.22)	($4.68)	($1.61)	($2.92)	($4.24)
FTTH	($4.02)	($7.74)	($11.20)	($4.10)	($7.82)	($11.30)
Data only*						
HFC	($1.90)	($3.63)	($5.35)	($1.89)	($3.60)	($5.30)
FTTH	($4.56)	($8.94)	($12.85)	($4.86)	($9.51)	($13.64)
High Penet. Data						
HFC	($0.80)	($1.45)	($2.10)	($0.38)	($0.63)	($0.87)
FTTH	($5.20)	($9.46)	($13.64)	($5.58)	($10.12)	($14.55)
High Penet. Data with 18%/yr Churn						
HFC	($0.52)	($0.93)	($1.29)	($0.02)	$0.42	$0.20
FTTH	($4.04)	($7.19)	($10.67)	($4.06)	($7.12)	($10.52)
High Penet. Data with 18%/yr Churn and ONT $50 Yr. 3						
HFC	($0.52)	($0.93)	($1.29)	($0.02)	$0.04	$0.20
FTTH	($2.68)	($4.83)	($6.88)	($2.25)	($3.95)	($5.55)

* Data rises from 58% to 98% penetration of basic subscribers within three years.

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DISCOUNTED CASH FLOW MODEL
INCUMBENT LEC UNSERVED 5,000
HOME MARKET

VOICE, DATA, VIDEO

	-------NPV ($mil.)-------	
Discount rate	16%	10%
HFC	$ 5.07	$ 7.37
FTTH	$ 2.22	$ 4.22

VOICE & DATA

	-------NPV ($mil.)-------	
Discount rate	16%	10%
HFC	$ 3.06	$ 4.41
FTTH	$ 0.67	$ 1.78

DISCOUNTED CASH FLOW MODEL
NEW ENTRANT TO UNSERVED 5,000
HOME MARKET

VOICE, DATA, VIDEO

	-------NPV ($mil.)-------	
Discount rate	16%	10%
HFC	$ 1.85	$ 3.36
FTTH	$ (0.66)	$ 0.75

VOICE & DATA

	-------NPV ($mil.)-------	
Discount rate	16%	10%
HFC	$ (0.12)	$ 0.45
FTTH	$ (2.21)	$ (1.68)

DISCOUNTED CASH FLOW MODEL ASSUMPTIONS (Two or more service providers)

Fiber-to-the-Home Model

1. Homes passed—5,000, 10,000 and 15,000. In each case minimal growth of only 50 homes/year was estimated.
2. Video subscribership projected to increase from 10% to 30% over 10 years.
3. Basic cable rate of $41.18 projected to increase 3.9%/yr.

4. Pay-to-basic subscribership estimated at 60%
5. Average premium service price $10.10.
6. 100% digital cable subscribership.
7. Digital cable costs an incremental $14.37 with 2% annual price increase.
8. Other subscription revenue of $2.36 includes, converters, FCC charges, right-of-way and maintenance fees.
9. One time charges/Misc. includes late fees, PPV, returned-check fees and reconnect charges.
10. High-speed data subscribership rises from 58% of basic subscribers to 98% of basic subscribers by year three.
11. VoIP telephone subscribership rises from 50% of basic cable subs in Year one to 85% by Year 4.
12. Misc. revenue includes advertising and home shopping commissions.
13. ARPU (average revenue per unit) rises from about $105 in Year 1 to $145 in Year 10.
14. Cash flow margin is projected to grow from 14% in Year 1 to 30% by Year 5 where it remains level
15. Discount rate is 16% reflecting risk and debt/equity mix based upon Knology, RCN and two publicly traded SMATV overbuilders.
16. Maintenance capital expenditure is $25/sub.
17. Digital subscriber churn rate is based on churn rates of overbuilders.
18. 2.0 set-tops/home
19. Digital set-top assumed to cost $268 with 10%/yr. price decline
20. Video headend is $450,000, $495,000 and $544,500 for 5,000, 10,000 and 15,000 home systems respectively.

21. High Speed data churn declines from 36%/yr. to 32% over 10 years
22. Optical Network terminals cost $500/subscriber for HSD/VoIP
23. HSD headend costs $200,000, $220,000 and $242,000 for 5,000, 10,000 and 15,000 home systems respectively.
24. Telephony headend equipment is $156,250, $171,875 and $189,063 for 5,000, 10,000 and 15,000 home systems respectively.
25. The 5,000, 10,000, and 15,000 home models are based upon 61.7, 123.5 and 185.2 miles of construction, of which 79% is aerial plant and 21% underground.
26. Construction costs (labor) for aerial plant is $41,415/mile and for underground it is $56,862/mile for an average of $44,659.
27. Construction materials cost is $27,610/mile for aerial and $30,618 for underground plant for an average of $28,241. Total cost/mile averages $72,900.

Hybrid Fiber-Coax Model

1. Homes passed—5,000, 10,000 and 15,000. In each case minimal growth of only 50 homes/year was estimated.
2. Video subscribership projected to increase from 10% to 30%.
3. Basic cable rate of $41.18 projected to increase 3.9%/yr.
4. Pay-to-basic subscribership estimated at 60%
5. Average premium service price $10.10.
6. 100% digital cable subscribership.
7. Digital cable costs an incremental $14.37 with 2% annual price increase.
8. Other subscription revenue of $2.36 includes, converters, FCC charges, right-of-way and maintenance fees.

9. One time charges/Misc. includes late fees, PPV, returned-check fees and reconnect charges.
10. High-speed data subscribership rises from 58% of basic subscribers to 98% of basic subscribers by year three.
11. VoIP telephone subscribership rises from 50% of basic cable subs in Year one to 85% by Year 4.
12. Misc. revenue includes advertising and home shopping commissions.
13. ARPU (average revenue per unit) rises from about $105 in Year 1 to $145 in Year 10.
14. Cash flow margin is projected to grow from 14% in Year 1 to 30% by Year 5 where it remains level
15. Discount rate is 16% reflecting risk and debt/equity mix based upon Knology, RCN and two publicly traded SMATV overbuilders.
16. Maintenance capital expenditure is $50/sub.
17. Digital subscriber churn rate is based on churn rate of overbuilders.
18. 1.6 set-tops/home
19. Digital set-top assumed to cost $276 with 10%/yr. price decline
20. Headend costs for video, high-speed data and telephony are identical to those for a FTTH network
21. High Speed data churn declines from 36%/yr. to 32% over 10 years
22. Optical Network terminals cost $500/subscriber for HSD/VoIP
23. The 5,000, 10,000, and 15,000 home models are based upon 61.7, 123.5 and 185.2 miles of construction, of which 79% is aerial plant and 21% underground.
28. Construction costs (labor) for aerial plant is $20,584/mile and for underground it is $23,942/mile plus $2,414/mile for splicing for a total of $23,702/mile.

29. Construction materials cost is $11,146/mile for common materials, $1,528/mile for aerial and $1,207 for underground plant. Total materials cost is $13,882/ mile. Total cost averages $37,584/mile.
30. Capitalized installation cost/gross ad is $70.
31. High-speed data installation is $75.
32. Cable modem costs $30 and declines in price by 4%/yr.
33. CMTS per net new subscriber is $35 and declines by 3%/yr.
34. Telephone EMTA/subscriber is $57 and battery backup is $60 with cost declining 3.5%/yr.

APPENDIX 1: SAMPLE DISCOUNTED CASH FLOW MODEL

TRIPLE PLAY 5000 HOME HFC MODEL

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Homes Passed	5,000	5,050	5,100	5,150	5,200	5,250	5,300	5,350	5,400	5,450
Total Basic Cable Subscribers	500	1,010	1,275	1,339	1,352	1,418	1,431	1,498	1,566	1,635
% Penetration	10%	20%	25%	26%	26%	27%	27%	28%	29%	30%
Average basic subscribers	250	755	1,143	1,307	1,346	1,385	1,424	1,465	1,532	1,601
Basic rate	41.18	42.82	44.54	46.32	48.17	50.10	52.10	54.18	56.35	58.61
% Change	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Basic cable revenue	123,527	387,973	610,582	726,435	777,746	832,451	890,445	952,234	1,035,968	1,125,581
Pay-to-basic ratio	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Avg. Premium Units	150	453	686	784	807	831	855	879	919	960
Avg. monthly rev/sub/mo.	10.10	10.15	10.20	10.25	10.30	10.36	10.41	10.46	10.51	10.56
Premium (pay) revenue	18,180	55,179	83,918	96,480	99,819	103,244	106,720	110,285	115,945	121,735
Premium revenue per basic	6.06	6.09	6.12	6.15	6.18	6.21	6.24	6.28	6.31	6.34
Digital cable households	500	1,010	1,275	1,339	1,352	1,418	1,431	1,498	1,566	1,635
Net new digital cable households	500	510	265	64	13	66	14	67	68	69
Pen. of basic subs	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Avg. Digital Set-Top Box Households	250	755	1,143	1,307	1,346	1,385	1,424	1,465	1,532	1,601
Recurring Rev./Sub/Mo.	$14.37	$14.65	$14.95	$15.25	$15.55	$15.86	$16.18	$16.50	$16.83	$17.17
Revenue from Digital Video Tier	$43,102.4	$132,772.7	$204,936.0	$239,132.1	$251,099.7	$263,593.1	$276,534.3	$290,036.3	$309,472.4	$329,776.0
Other subscription revenue	7,088	21,834	33,702	39,325	41,293	43,348	45,476	47,696	50,893	54,232
Other sub rev/basic	2.36	2.41	2.46	2.51	2.56	2.61	2.66	2.71	2.77	2.82
Total subscription revenue	191,898	597,759	933,137	1,101,372	1,169,958	1,242,637	1,319,176	1,400,252	1,512,278	1,631,323
One time charges/misc.	4,228	13,022	20,100	23,454	24,628	25,854	27,123	28,447	30,353	32,345
Misc. rev/sub	1.41	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.65	1.68

TRIPLE PLAY 5000 HOME HFC MODEL
(Continued)

	2007	2008	2009	2010	2010	2012	2013	2014	2015	2016
HSD capable Homes	5,000	5,050	5,100	5,150	5,200	5,250	5,300	5,350	5,400	5,450
HSD Subscribers	290	788	1,250	1,312	1,325	1,389	1,402	1,468	1,535	1,602
Net Adds	290	498	462	63	13	64	13	66	67	68
Data/Video	58%	78%	98%	98%	98%	98%	98%	98%	98%	98%
Average HSD Subscribers	145	539	1,019	1,281	1,319	1,357	1,396	1,435	1,501	1,568
Cable HSD residential revenue/sub/mo.	39.37	38.66	38.04	37.36	36.56	35.61	34.90	34.55	34.21	33.86
Residential HSD revenue	68,502	249,975	472,512	584,648	591,100	595,419	596,483	601,073	622,490	643,820
VoIP capable Homes	5,000	5,050	5,100	5,150	5,200	5,250	5,300	5,350	5,400	5,450
VoIP Subscribers	250	707	1,020	1,138	1,149	1,205	1,216	1,273	1,331	1,390
Net Adds	250	707	313	118	11	56	11	57	58	59
VoIP/Video	50.0%	70.0%	80.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Average VoIP Subscribers	125.0	353.5	863.5	1,079.1	1,143.7	1,177.0	1,210.6	1,244.8	1,302.2	1,360.4
VoIP residential revenue/sub/mo.	34.63	33.69	32.84	32.23	31.56	30.72	29.97	29.70	29.43	29.16
Residential Phone revenue	51,945.0	142,913.0	340,288.1	417,343.0	433,132.6	433,903.1	435,384.7	443,655.6	459,885.0	476,039.9
Total customer revenue	316,573	1,003,670	1,766,038	2,126,817	2,218,818	2,297,813	2,378,167	2,473,428	2,625,006	2,783,527
Total customer ARPU	105.52	110.78	128.81	135.60	137.42	138.28	139.15	140.74	142.79	144.93
Misc.	1,866	5,747	8,871	10,352	10,870	11,410	11,971	12,555	13,396	14,275
Misc. ARPU	0.62	0.63	0.65	0.66	0.67	0.69	0.70	0.71	0.73	0.74
Total Revenue	**318,438**	**1,009,417**	**1,774,909**	**2,137,169**	**2,229,688**	**2,309,223**	**2,390,137**	**2,485,983**	**2,638,402**	**2,797,803**
ARPU	106.15	111.41	129.46	136.26	138.10	138.97	139.85	141.46	143.52	145.67
Total Costs	**273,857**	**837,816**	**1,419,927**	**1,602,876**	**1,560,782**	**1,616,456**	**1,673,096**	**1,740,188**	**1,846,882**	**1,958,462**
Total Capex	3,460,355	453,466	342,172	203,286	173,376	199,888	181,291	201,736	206,043	210,075

TRIPLE PLAY 5000 HOME HFC MODEL
(Continued)

	2007	2008	2009	2010	2010	2012	2013	2014	2015	2016
Cash Flow	**44,581**	**171,601**	**354,982**	**534,292**	**668,906**	**692,767**	**717,041**	**745,795**	**791,521**	**839,341**
C.F. margin	14%	17%	20%	25%	30%	30%	30%	30%	30%	30%
Total Free Cash Flow	(3,415,774)	(281,865)	12,810	331,006	495,531	492,879	535,750	544,059	585,478	629,266
Discount Rate	16.0%									
	1.16	1.35	1.56	1.81	2.10	2.44	2.83	3.28	3.80	4.41
Discount Factor	0.86	0.74	0.64	0.55	0.48	0.41	0.35	0.31	0.26	0.23
Discounted Free Cash Flow	(2,944,633)	(209,472)	8,207	182,811	235,929	202,298	189,564	165,952	153,953	142,644
CUME Discounted Free Cash Flow	(2,944,633)	(3,154,105)	(3,145,898)	(2,963,087)	(2,727,158)	(2,524,859)	(2,335,295)	(2,169,343)	(2,015,390)	(1,872,746)
NPV of DCF	**(1,872,746)**									

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CAPITAL EXPENDITURES 5000 HOME HFC MODEL

Maintenance										
Avg. number of basic subscribers	250	755	1,143	1,307	1,346	1,385	1,424	1,465	1,532	1,601
Maintenance capital expenditures/ basic sub	50	50	50	50	50	50	50	50	50	50
Maintenance capital expenditures	**$12,500**	**$37,750**	**$57,125**	**$65,350**	**$67,275**	**$69,238**	**$71,213**	**$73,225**	**$76,600**	**$80,025**
Digital										
Digital subs	500	1,010	1,275	1,339	1,352	1,418	1,431	1,498	1,566	1,635
Net adds	500	510	265	64	3	66	14	67	68	69
Annual churn rate	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Digital churn	-	200	404	510	536	541	567	572	599	626
Gross connects/reconnects	500	710	669	574	549	606	581	639	667	695
Avg. # of converters/ HH	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7
Digital boxes required	785	1,123	1,077	945	924	1,026	988	1,093	1,146	1,201
Digital disconnects/downgrades	-	200	404	510	536	541	567	572	599	626
Lost box/obsolescence %	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Boxes recovered	-	285	585	755	812	824	868	881	927	973
Net change in digital boxes	785.3	838	492	189	112	202	119	212	220	227
Standard box cost	$276	$248	$224	$201	$181	$163	$147	$132	$119	$107
Digital set-top capex	**$216,754**	**$208,159**	**$109,916**	**$38,080**	**$ 20,300**	**$32,988**	**$17,516**	**$28,040**	**$6,113**	**$ 24,306**
Gross digital connects/reconnects	500	710	669	574	549	606	581	639	667	695
Capitalized installation cost/ gross add	70	70	70	70	70	70	70	70	70	70
Digital Install Cost	**$35,000**	**$49,700**	**$46,830**	**$40,180**	**$38,402**	**$42,441**	**$40,635**	**$44,758**	**$46,704**	**$48,678**
Video Headend	**$450,000**									
Total digital capital expenditures	**$701,754**	**$257,859**	**$156,746**	**$78,260**	**$58,702**	**$75,429**	**$58,151**	**$72,798**	**$72,817**	**$72,984**
High-Speed Data										
HSD Subs	290	780	1,274	1,299	1,323	1,372	1,421	1,470	1,519	1,568
Net adds	290	490	494	25	25	49	49	49	49	49
Annual churn rate	*36%*	*35%*	*34%*	*34%*	*33%*	*33%*	*33%*	*32%*	*32%*	*32%*
HSD churn	-	101.5	265.2	433.2	428.5	436.6	452.8	454.7	470.4	481.2

CAPITAL EXPENDITURES 5000 HOME HFC MODEL
(Continued)

Gross connects	290.0	591.5	759.2	457.7	453.0	485.6	501.8	503.7	519.4	530.2
Cost per modem	30.00	28.80	27.65	26.54	25.48	24.46	23.48	22.54	21.64	20.78
Modem Capex	**$8,700**	**$17,035**	**$20,990**	**$12,147**	**$11,543**	**$11,878**	**$11,783**	**$11,356**	**$11,241**	**$11,016**
Cost/Install	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
HSD install capex	**$21,750**	**$44,363**	**$56,940**	**$34,325**	**$33,975**	**$36,419**	**$37,632**	**$37,779**	**$38,955**	**$39,766**
CMTS/net add	35.00	33.95	32.93	31.94	30.99	30.06	29.15	28.28	27.43	26.61
CMTS cost	**$10,150**	**$16,636**	**$16,268**	**$783**	**$759**	**$1,473**	**$1,429**	**$1,386**	**$1,344**	**$1,304**
HSD Headend Costs	**$200,000**									
HSD Capital Expenditures	**$240,600**	**$78,033**	**$94,199**	**$47,254**	**$46,277**	**$49,770**	**$50,843**	**$50,520**	**$51,540**	**$52,086**
Telephony Capex										
Telephony Net Adds	250	707	313	118	11	56	11	57	58	59
Total Cost per net add	117	113	109	105	101	98	94	91	88	85
Telephony Headend	**156,250**									
Telephony Capital Expenditures	**185,500**	**79,824**	**34,102**	**12,422**	**1,121**	**5,451**	**1,084**	**5,192**	**5,085**	**4,980**
Construction Costs										
Aerial Construction	1,003,765									
Underground Construction	310,359									
Fiber Splicing	148,984									
Total Labor	1,463,108									
Outside Plant Materials Cost										
Common Materials	688,039									
Aerial Materials	94,321									
Underground Materials	74,533									
Total Materials	856,893									
Total Construction Cost	2,320,001									
Total Capital Expenditures	**3,460,355**	**453,466**	**342,172**	**203,286**	**173,376**	**199,888**	**181,291**	**201,736**	**206,043**	**210,075**

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