

Competition in Local-Service Sectors

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Abstract

Although economically very important, local-service sectors have received little attention in the extensive literature on competitive interactions. Detailed data gathering in these sectors is hard, not only because of the multitude of local players, but also because key service dimensions are hard to quantify. Using empirical entry models in the tradition of Bresnahan and Reiss (1990; 1991), we infer information on these sectors' degree of competition from the observed entry decisions in different local markets.

We apply the empirical entry model to the video-rental market. Additional entries of video stores are found to significantly increase the level of competition. This occurs not only when a second player enters the market, but also in markets already characterized by two or more incumbents. Unlike the predictions of many economic models, we find this increase to be larger when the entry occurs in a duopoly than in a monopoly.

Several control variables included in the model offer additional insights. As such, we find evidence of cannibalization from the upstream channel (movie theatres), but not from the downstream channel (premium cable). In addition, various socio-demographic characteristics of the trading zone, such as income and household size, are found to also have a significant impact on store performance.

Keywords: Competition, Local-service sectors, Empirical entry models, Movie industry

1. INTRODUCTION

Traditionally, marketing researchers have concentrated on *consumer* response to marketing decision variables. Recently, increasing attention has been devoted to the behavior of *competitors* in the marketplace, as reflected in special issues on competition in the *International Journal of Research in Marketing* (2001) and *Marketing Science* (2005). Many of the empirical applications in the area, however, deal with fast-moving consumer goods (e.g. Leeflang & Wittink, 1996), the car market (e.g. Sudhir, 2001) and the pharmaceutical industry (e.g. Shankar, 1997). Not surprisingly, these are sectors where detailed information on performance and support variables tends to be available.¹

In service sectors such as the hotel, restaurant and video-rental industry, however, it is difficult to collect data on the different marketing and/or performance variables of all players in the market. Firms in these sectors typically compete in local markets, as customers need local contact with the service provider (Fuentelsaz, Gomez & Polo, 2002). These so-called local-service sectors are economically very important. For example, in 2001, the US and UK hotel and restaurant sector contributed respectively 1% (\$ 88.4 billion dollar) and 3% (£29 billion) to Total Gross Value Added (United Nations Statistics).

Certain characteristics of local-service sectors inhibit the application of traditional methods that have been used to make inferences on the competitive structure of a market, such as Granger-Causality tests (e.g. Leeflang & Wittink, 1996), the Conjectural Variations approach (e.g. Kim & Parker, 1999), and the Non-Nested Model Comparisons approach (e.g. Kadiyali, Chintagunta & Vilcassim, 2000). Two key inhibiting factors are (i) the large number of local players, and (ii) the existence of difficult-to-observe decision variables.

First, local-service markets are often fragmented with many local players. The UK hotel sector, for example, consists of more than 40,000 establishments, while Germany

¹ Data providers in those sectors are, for example, IRI or A.C. Nielsen for fast-moving consumer goods, Ward's Automotive Handbook for cars, and IMS in the pharmaceutical industry.

(France) has around 38,000 (20,000) hotels (Eurostat). As customers expect local contact with the firm, operating in a geographical market necessitates in-market facilities from which to deliver the service (Fuentelsaz et al., 2002). Gathering detailed data on all individual market participants is nearly impossible.

Second, firms in service sectors not only compete on the basis of readily observable tactical marketing variables, but also on a number of other, less directly observable, factors such as personal interactions with employees and the physical surroundings. Even though measurement scales have been developed to operationalize these components (see e.g. SERVQUAL in Parasuraman, Zeithaml & Berry, 1988), it quickly becomes impossible to obtain the relevant measures for all players in the market.

Because of these characteristics of many local-service sectors, we advocate the use of another approach to make competitive inferences that has less stringent data requirements. The general idea, first introduced in Bresnahan and Reiss (1990; 1991), is to infer information on the degree of competition from the observed entry decisions, and its relationship with local market size and other market characteristics. Hence, to draw inferences on the degree of competition, it is not necessary to observe individual firms' profits. Intuitively, the empirical framework studies by how much the local market size should increase to sustain an additional entrant. If the required market size increase is large, this implies that an additional entrant leads to a strong increase in competition.

We illustrate the proposed framework in the context of the Belgian video-rental industry. We find that competition increases with every entry in the market. Unlike Asplund and Sandin (1999) and Bresnahan and Reiss (1991), we find that competition still increases upon the third and fourth entrance. Furthermore, contrary to the prediction of most economic theories, our results indicate that the increase in the level of competition is largest when entry occurs in a duopoly. In addition, various characteristics of the trading zone, such as the

presence of a movie theatre and socio-demographic characteristics as average income and household size, are found to also influence video store profitability.

2. MODEL DEVELOPMENT

Following Fok and Franses (2004), entry models can broadly be divided into two types of approaches: (i) noncooperative game-theoretic models, and (ii) non-structural empirical models estimated on time-series or panel data. The first set of studies takes a normative viewpoint, and prescribes how firms should respond in an optimal way to later entrants. Empirical support for these models, however, is often quite limited or completely absent. The second type of research, in contrast, is more data driven, and explicitly based on observed market situations. However, these studies are mostly non-structural in nature, and therefore less suited for comparing and testing alternative theories of strategic behavior (Kadiyali, Sudhir & Rao, 2001).² Our approach can be situated in between these two broad classes. On the one hand, we assume profit-maximizing agents who enter a particular market as long as this is profitable. Following Bresnahan and Reiss (1990; 1991), we study the long-term effect of entry on competition starting from a long-term free entry equilibrium condition. Based on this premise, the observed number of players allows one to infer bounds on the profitability in each local market, and one can use the cross-sectional variation in the number of players in different local markets to empirically derive what market size is required, on average, to support a given number of players. Hence, rather than analyzing the over-time variation in performance as the number of firms within a given market changes, we compare the number of firms present across a sample of different markets at a given time.

Because of the long-term free entry equilibrium assumption, one can infer the profitability in each local market from the observed number of firms and its relation with observed market characteristics. Using the estimated relationship between the observed

² We refer to Fok and Franses (2004) for an extensive literature review on both types of models.

number of (profitable) entrants and the observed market characteristics, one can subsequently derive entry thresholds. An entry threshold is defined as the minimum market size required for a given number of firms to break even, after controlling for other observed market characteristics, in a market. It is the population level at which the observed profitability is equal to zero. Entry thresholds provide information on how the extent of competition changes as more firms enter the market. Specifically, if an additional entrant provides a strong constraint on firm profits, the entry threshold to carry that additional firm raises more than proportionally. For example, if the critical market size required to carry one firm consists of 1,000 inhabitants and the market size to carry two firms is 3,000 inhabitants, one can infer that the second firm increases the degree of competition in that market, as the per-firm threshold has increased. In contrast, if the market size required to support two firms is 2,000, the entry of the second firm did not affect the level of competition, as the per-firm threshold did not change. The evolution in the empirically-estimated thresholds can be compared with the evolution predicted by different models of oligopolistic competition, thereby allowing us to compare and test alternative theories of strategic behavior.

2.1. Econometric framework

Firm profits when there are n firms in market i are given by the latent variable Π_i^n , which consists of a deterministic part (π_i^n) and a random part (ε_i):

$$\Pi_i^n = \pi_i^n - \varepsilon_i \quad . \quad (1)$$

The deterministic part is allowed to depend on the number of firms in the market. The random part represents an error term that is specific to market i , but common to all firms in that market. This error term is assumed to be unobserved to the researcher, but observed by any player in the market. The assumption that the error term is common to all firms within a market implies that firms are treated as homogeneous. Therefore, this approach does not

allow for firm-specific effects.³ These assumptions give rise to an ordered probit specification, as will be explained next.

The latent variable Π_i^n is linked to the observed number of firms through the assumption that there will be entry as long as this is profitable. Making the weak assumption that profits decrease as the number of firms increases, i.e. $\Pi_i^n > \Pi_i^{n+1}$, we observe a market without any players when even a monopolist does not find it profitable to enter (i.e. $\Pi_i^1 < 0$). Similarly, the number of firms in the market will be equal to one if one firm finds it profitable to enter the market (i.e. $\Pi_i^1 \geq 0$), while a second firm would be unprofitable (i.e. $\Pi_i^2 < 0$). Similar conditions can be formed for all market structures n observed in the sample (with $n = 1, \dots, K-1$ with K the largest market structure observed in the data). Finally, a market will contain K players when they all find it profitable to enter (i.e. $\Pi_i^K \geq 0$). More formally, we can state these conditions, derived from (1), as follows:

$$\begin{aligned} N_i = 0 & \quad \text{if} & \quad \varepsilon_i > \pi_i^1 \\ N_i = n & \quad \text{if} & \quad \pi_i^n \geq \varepsilon_i > \pi_i^{n+1}, & \quad n = 1, \dots, K-1 \\ N_i = K & \quad \text{if} & \quad \pi_i^K \geq \varepsilon_i \quad . \end{aligned} \quad (2)$$

If the market-specific errors (ε_i) follow a standard normal distribution function, the market-entry probabilities are given as:

$$\begin{aligned} P(N_i = 0) & = 1 - \Phi(\pi_i^1) \\ P(N_i = n) & = \Phi(\pi_i^n) - \Phi(\pi_i^{n+1}), & \quad n = 1, \dots, K-1 \\ P(N_i = K) & = \Phi(\pi_i^K) \quad , \end{aligned} \quad (3)$$

with $\Phi(\cdot)$ the cumulative standard normal distribution. From these probabilities, the likelihood function can be constructed (with I the number of markets in the sample) as:

$$L = \prod_{i=1}^I \prod_{n=0}^K P(N_i = n)^{z_{in}}, \quad \text{with} \quad z_{in} = 1 \quad \text{if} \quad N_i = n \quad , \quad (4)$$

corresponding to the likelihood function of an ordered probit model (Franses & Paap, 2001).

³ Berry (1992) uses a model that accounts for firm-specific effects. However, his approach is only applicable in a setting where it is possible to exploit information on the identity of the firms, for example when there is a limited number of different players across the various markets. As this is not the case for the sector under study, we cannot use this approach.

2.2. Specification

The deterministic profitability part π_i^n may be modeled as a function of market characteristics. Overall store performance has been found to increase with local market potential and buying power, and to vary with the level of local competition (Campo, Gijbrecchts, Goossens & Verhetsel, 2000). Local market potential and buying power are influenced by characteristics of the local trading zone, such as (i) its socio-demographic composition (e.g. the market's population, age distribution and income level), and (ii) the availability of possible substitutes in the environment (Hoch, Kim, Montgomery & Rossi, 1995; Mulhern, Williams & Leone, 1998). In the case of video-rental stores, these could, for example, include the presence of movie theatres and/or premium cable.⁴ We add both sets of market characteristics as control variables, and specify store performance (Π_i^n) as:

$$\Pi_i^n = \pi_i^n - \varepsilon_i, \tag{5}$$

$$\text{with } \pi_i^n = \alpha \ln(\text{POP}_i) + \beta \text{ DEMOGR}_i + \gamma \text{ SUBST}_i - \lambda^n \text{ D}_i^n,$$

which is subsequently substituted in expressions (3) and (4). POP_i is the population in market i , DEMOGR_i is a vector of socio-demographic market characteristics, SUBST_i is a vector capturing the presence of possible substitutes in market i , and D_i^n a vector of dummy variables indicating whether the number of firms in market i is equal to n . The parameters λ^n can be interpreted as measuring the entry effect of the n -th firm. A positive difference between λ^n and λ^{n-1} is interpreted as evidence that entry has a negative impact on performance.

The estimated parameters ($\hat{\alpha}, \hat{\beta}, \hat{\gamma}, \hat{\lambda}^n$) provide two types of insights. First, they have an interest in their own right, as they allow us to test which factors have a significant impact

⁴ Premium-cable providers are allowed to show a movie about a year before regular (cable) television providers (Doyle, 2002). Subscribers to this channel pay a fixed per-month subscription rate.

on firm performance. Second, they can be used to derive entry thresholds, i.e. the minimum market sizes required to support a given number of firms. These thresholds offer insights on how entry affects the extent of competition. The n -firm entry threshold (S^n) is defined by the population level at which the deterministic part of firm profit (π_i^n) is equal to zero. Using (5), S^n can be computed as a nonlinear transformation of the estimated parameters:

$$S^n = \exp\left(-\frac{\hat{\beta} \overline{\text{DEMOGR}} + \hat{\gamma} \overline{\text{SUBST}} - \hat{\lambda}^n}{\hat{\alpha}}\right), \quad (6)$$

where $\overline{\text{DEMOGR}}$ and $\overline{\text{SUBST}}$ are the covariates evaluated at their sample mean. As discussed earlier, entry thresholds increase disproportionately with the number of firms if entry has a substantial impact on firm performance, and increase proportionally if entry does not affect firm performance. The entry-threshold ratio (R^n) summarizes this information. It is defined as the ratio of the per-firm n -firm entry threshold over the per-firm $n-1$ entry threshold, and can be computed as:

$$R^n = \frac{S^n}{n} \bigg/ \frac{S^{n-1}}{n-1} = \exp\left(\frac{\hat{\lambda}^n - \hat{\lambda}^{n-1}}{\hat{\alpha}}\right) \times \frac{n-1}{n}. \quad (7)$$

If the threshold ratio is above one, the extent of competition increases with the additional entry. For example, an estimated threshold ratio of 1.05 means that the per-firm market size has to increase by 5% to support an additional firm. Note that the threshold ratios in (7) only depend on the entry effects λ^n and on the market size parameter α . Although they do not directly depend on the other market characteristics, they do so indirectly as the parameter estimates of λ^n and α may be affected by their inclusion in the model.

Some additional remarks on specification (5) are in order. First, population could, of course, be viewed as one additional element of the vector of socio-demographic characteristics DEMOGR_i . However, we write it separately since it is used to compute the entry thresholds, which summarize the role of competition. Second, population enters in

logarithmic form. This ensures that the computed entry thresholds are non-negative. In addition, the logarithmic functional form is consistent with a specification in which the drivers of store performance influence the ratio of variable profits over fixed costs, as in Genesove (2004). It is therefore not necessary to separately identify the effects of market characteristics on variable profits versus fixed costs, which proves to be difficult in practice.

3. CONCEPTUAL DEVELOPMENT

In line with previous research, we argue that overall store performance varies with (i) the level of local competition, and (ii) market-specific characteristics.

3.1. Competition

The competitive character of the trading area may strongly affect a store's performance. The extent of competition has often been operationalized through concentration indices such as the combined market share of the top players in the market or the Herfindahl Index. In local-service industries, however, market-share information on the various incumbents is often unavailable (see Section 1). Other studies have used the number of market players as a proxy for the extent of competition/market structure (see e.g. Dhar & Hoch, 1997). However, the assumed exogeneity of the market-structure variables in those studies can be questioned. Market structure not only influences conduct and performance. Conduct can, in turn, affect market structure (Kadiyali et al., 2001). An observed market structure is then seen as the outcome of firms' profit-maximizing decisions that take the expected behavior and performance of incumbent and potential players into account (Manuszak, 2002). Our approach addresses this concern. Market structure is treated as an endogenous variable, as determined through the zero-profit market equilibrium. Through the evolution in the aforementioned threshold ratios, we are subsequently able to quantify how

the extent of competition changes when a new player enters various existing market structures.

Different patterns for this evolution may be obtained. Both the Cournot and the differentiated Bertrand model predict the increase in competition to be largest when entry occurs in a monopoly market. Competition will then continue to increase with new entrants, albeit at a diminishing rate, until the market has become perfectly competitive, i.e. until price-cost margins have become equal to zero. According to these models, estimated threshold ratios will be greater than one, but decrease as more players enter the market until the market has become perfectly competitive, in which case the estimated threshold ratio will be equal to one. In the Bertrand model with undifferentiated products, in contrast, new entrants do not increase the extent of competition as soon as two firms are already active (e.g. Tirole, 1988). In this model, only the first estimated threshold ratio will be significantly larger than one. Third, in contestable markets, the competitive effect of entry is already zero for entries into monopoly markets. Indeed, in these markets, the threat of potential entrants is already effective in disciplining the incumbent firm, decreasing its price-cost margin already before entry (Baumol, Panzar & Willig, 1982). Actual entry will therefore not increase the extent of competition, implying that all estimated threshold ratios for contestable markets will be equal to one. Also in markets with sustainable collusion (e.g. d'Aspremont & Gabszewicz, 1985), the effect of entry on the extent of competition in the market will be zero, as long as the entry does not cause the collusion to break down. Estimated threshold ratios for collusive markets should thus be equal to one.

Hence, different model assumptions lead to differing normative implications, making the actual evolution of the entry thresholds an empirical issue.

3.2. Market-specific characteristics

To make a more reliable assessment of the degree of competition in a market, we add two types of market-specific control variables that are likely to impact store performance within a market: (i) the availability of possible substitutes in the environment (Mulhern et al., 1998), such as movie theatres and premium cable, and (ii) various socio-demographic characteristics of the trading zone (Campo et al., 2000).

3.2.1. Presence of substitute channels

In the movie industry, a typical release sequence starts with the theatrical release, followed by a pay-per-view window after 4-6 months, and a home-video release after 6-9 months. A movie, on average, becomes available through the premium-cable channel approximately 12 months after the first theatrical release, and through the regular television channel after another 12 months (Doyle, 2002). Even though some minor modifications to the product may be made in the process of sequential distribution, the main differences between the different channels have to do with the timing and the price (Lehmann & Weinberg, 2000).

Different versions of the same product can be considered substitutes, causing possible cannibalization from channels upstream and downstream in the sequence. Indeed, potential customers may already have purchased the product (in our setting, seen the movie) in an earlier channel, and subsequently leave the market (Lehmann & Weinberg, 2000), while others may have an incentive to postpone their purchase as they anticipate a price decrease (Purohit, 1997). If these phenomena, which so far have been documented at the individual product (movie) level, occur consistently across multiple products (movies), the overall performance of the intermediate channel (the video stores) will be affected negatively by the presence of the upstream (movie theatres) and downstream (premium cable) channel.

3.2.2. Socio-demographic control variables

Also various socio-demographic characteristics of the trading zone may have an impact on the profitability of firms operating in a given market. We control for the following characteristics: average income and household size, the age and ethnic composition of the population, and the degree of urbanization of the local market.

Income As it has a positive impact on purchasing power, income in a local market may have a positive effect on the profitability of the various firms in that trading zone. On the other hand, as high-income families are also less price sensitive (see e.g. Hoch et al., 1995), income may cause a shift in demand towards the more expensive channels. Vogel (2001) estimates that watching a rented home video is approximately seven times cheaper (per person per hour) than a movie-theatre visit, and somewhat more expensive than watching it on premium cable. Of course, each of these options is more expensive than watching regular television. As video rental is neither the most expensive nor the cheapest option, the net effect of these opposing forces is hard to predict. In addition, wealthy people usually have higher opportunity costs (Hoch et al., 1995), which may influence their valuation of time and their sensitivity to services offered within the different channels of movie distribution.

Household size Larger families have been found to be more price sensitive (Hoch et al., 1995), which may affect the share of a movie distribution channel relative to both the more (upstream) and less (downstream) expensive channels in the sequence, even though the net effect is again hard to predict. Larger families may also be characterized by a higher heterogeneity in preferences, which may translate in the purchase of multiple products.

Age Even though retired people have more leisure time, they have been found to spend less on entertainment than younger people (Vogel, 2001), and to be more price-elastic (Hoch et al., 1995), which may affect their channel choice for movie entertainment.

Ethnicity Different ethnic groups have been found to differ in their price elasticity (Hoch et al., 1995), which may (as argued before) affect their demand for high- versus low-cost forms of entertainment. In addition, minority groups often tend to participate less in mainstream leisure activities because of differences in economic resources, value systems, norms and socialization patterns (Floyd, Shinew, McGuire & Noe, 1994).

Urbanization We also include the level of urbanization as a control variable, as this has been shown to affect shopping behavior (e.g. Campo et al., 2000).

4. DATA AND INDUSTRY

4.1. The Video-rental market

The movie industry does not only derive revenue from theatrical exhibition, but also from home videos, premium cable, and other television channels (Vogel, 2001). Marketing researchers have focused almost exclusively on the movie-theatre channel (see Eliashberg, Elberse & Leenders, 2006 for a review). Recently, however, the home-video channel surpassed the movie-theatre industry as most important source of consumer spending on movies. In 2002, for example, US consumers spent more than \$22 billion on video and DVD rental (\$ 10 bn) and buying (\$12 bn) compared to almost \$10 billion on theatre tickets (IVF, 2003; MPA, 2003). Also in Western Europe, consumers spend a considerable amount on home video, reaching almost \$12 billion in 2002 (IVF, 2003).

We concentrate on the Belgian market, which is representative for Western Europe in terms of various macro-economic indicators (GDP/capita and wholesale, retail trade, restaurants and hotels as % of GDP), and, even more importantly, on several key characteristics of the video-rental business, such as VCR and DVD penetration, average spending on video rental, the average number of rental transactions per TV household, and the average rental charge (see Table 1).

[Table 1 goes about here]

The International Video Federation estimates that the number of Belgian video-rental outlets did not increase over the years 2000-2002 (IVF, 2003), supporting the notion that the market has reached an equilibrium. Moreover, the video-rental sector is characterized by limited entry and exit barriers (Gomery, 1993), supporting our assumption that video stores enter as long as this is profitable, and leave the market when they are not profitable.

4.2. Data description

4.2.1. Sample composition

Our sample consists of all active video stores in 2003 (1,275 in total) in 2,576 Belgian local markets. We define local markets at the level of “townships”. Townships used to form separate juridical entities. In the late seventies, several of them were merged with each other to form larger “municipalities”. The smaller level of aggregation is selected because of two reasons. First, local markets should be self-contained in that there is no relevant direct competition coming from outside the defined market. Second, townships still have their own community centre, around which several stores tend to cluster and which people still visit for many of their day-to-day (grocery) purchases. As customers have been found to primarily rent their videos from a store close to their home (Zhu, 2001),⁵ which reflects the typical need for local contacts in service encounters, the smaller level of aggregation is more appropriate. Following Asplund and Sandin (1999), we exclude all townships of the largest Belgian cities from our sample. As such, we exclude all townships of the 18 largest cities (e.g. Antwerp, Ghent and Liege) in Belgium (i.e. 167 townships), as well as the 19 municipalities that constitute Brussels. These townships were found to be five times larger than the rest in terms of population, and therefore could consist of multiple local markets. In total, we have 2,390

⁵ In this setting, the limited distance to a local video store is even more relevant, as each interaction requires two contacts (renting plus returning of the video).

or 93% of all townships left for analysis, with an average population size of around 3,000. To control for potentially relevant cultural and economic differences between the two main Belgian regions, i.e. the Dutch-speaking Northern part (Flanders) and the French-speaking Southern part (Wallonia), we also include an additional region dummy variable.

4.2.2. Dependent variable

Data on the number of video stores operating in each local market (township) was obtained from a specialized data provider, which derived the information primarily from the Yellow Pages. Information from the Yellow Pages was also used to identify the relevant stores in a trading zone by Campo et al. (2000) and Seim (2001), among others. These data were extensively cross-validated (and in a limited number of instances, extended) with addresses obtained from the websites of Belgian video-store chains, contacts with film distributors, and field research. Summary statistics on the relative occurrence of various market structures are given in Table 2. A majority of the townships (80%) does not have a local video store, while other market structures reflect a monopoly or duopoly situation (276 and 120 cases, respectively). There are 40 local markets with three stores and 33 markets with more than three stores. As there are few observations with more than four videos stores, we combine these observations in a single 4+ category. A similar practice was adopted in Bresnahan and Reiss (1991) and Manuszak (2002).

[Insert Table 2 about here]

4.2.3. Explanatory variables

Data on the local markets' demographic characteristics was obtained through the Belgian National Institute of Statistics (NIS). Some of the information was only available at a higher level of aggregation (e.g. municipality or zipcode level). In these cases, we followed

Bresnahan and Reiss (1991) and Manuszak (2002), and assigned the corresponding value to each local market in that municipality or zipcode area.

We measure the population size of a trading zone through the log of its number of inhabitants (in 1,000). We operationalize household size as the average number of people per household (based on per-municipality data). Income information was obtained from per-municipality tax-declaration data. In line with Campo et al. (2000), we measure a market's income distribution through two variables, capturing the percentage of tax declarations with a low (i.e. <\$ 13,400) and high (i.e. > \$ 26,800) net income. These cut-off values are driven by the income classes reported by the Belgian NIS. Census information is used to derive the age and ethnic composition of the different local markets. The number of retired people is proxied by the percentage of people older than 64 years, while the ethnic composition is measured as the percentage of foreigners. We use dummy variables to identify highly urbanized areas, and to indicate whether the considered township is located in Flanders.

To quantify the effect of the presence of substitute channels, two additional variables are introduced. First, we construct a dummy variable indicating whether a movie theatre is situated in a municipality within 7 miles of the center of the municipality to which a given township belongs on the basis of data provided by the NIS. The seven-mile cut-off value is based on industry reports which indicate that moviegoers are, on average, willing to travel 7 miles to go to a movie theatre (Newspaper Society, 2000).⁶ Information on the effect of premium cable (at the zipcode level) was only available for Wallonia, the Southern part of the country. The variable was operationalized as the percentage of households in the zipcode with a premium-cable subscription. Data were provided by Canal+ Wallonia, the only provider of premium cable in the region.⁷ Summary statistics are given in Table 3.

⁶ Results, not reported here, show that the findings on the effect of the presence of a movie theatre hold with deviations of one mile above and below this cut-off point.

⁷ As there is only one provider of premium cable in Wallonia, offerings as well as price are uniform in the region.

[Insert Table 3 about here]

5. EMPIRICAL RESULTS

Table 4 presents the parameter estimates based on the ordered probit model as outlined in Section 2. Calculated Variance Inflation Factors were all well below the critical threshold of 10, indicating that there was no serious multicollinearity problem. The first two columns focus on the effect of competition. In column 2, we control for the presence/absence of a movie theatre in the trading zone, and for the socio-demographic variables outlined in section 3.2.2.. Both specifications are based on the full sample, i.e. include both the region of Flanders and Wallonia. The third column presents the results from a specification that also controls for the effect of premium cable. Since information on premium-cable subscriptions was not available for Flanders, the estimates in the third column are based on the sample for Wallonia only. Table 5 subsequently presents the estimated entry thresholds and threshold ratios implied by the estimates of the three specifications in Table 4.

[Insert Tables 4 and 5 about here]

5.1. Competition

To discuss our findings on the extent of competition between video stores in the same local market, we first discuss the results of specification (1), which is based on the full sample, excluding the market-specific control variables. We subsequently address the robustness of our findings when the effect of substitute channels and socio-demographic information is included.

As mentioned in section 2.2., the estimated λ^n parameters measure the impact of competition on firm performance, and a positive difference between λ^n and λ^{n-1} can be interpreted as evidence that entry has a negative effect on performance. The results show that

the differences are always positive. For example, the difference between λ^2 and λ^1 is $3.03 - 2.02 = 1.01$. To better interpret the parameters, we turn to the more informative competition measures, i.e. the entry thresholds S^n and implied entry-threshold ratios R^n , which are computed from the λ^n ; see equations (6) and (7) and the earlier discussion in section 2.2.. The first panel in Table 5 shows the entry-threshold levels S^n (computed for an average market). Specification (1) implies that a monopolist needs a market size of approximately 5,200 inhabitants to break even. The break-even market sizes for a duopoly, and for markets with three and four or more firms are, respectively, around 11,800, 23,400 and 38,800. This shows that market size needs to increase disproportionately to support an additional entry, suggesting that competition is indeed a constraint on firm performance.

The entry-threshold ratios R^n show this more accurately. The entry-threshold ratio for a duopoly relative to a monopoly is equal to 1.14. In words, this says that the per-firm minimum required market size to support a duopoly market structure is 14% larger than the market size required to support a monopoly. The entry-threshold ratios for subsequent entry are, respectively, 1.32 and 1.24: the per-firm market size should increase by an additional 32% to support three firms, and by an additional 24% to support four or more firms. Wald tests confirm that the ratios are all significantly above one. Hence, we find that competition has a significant negative effect on firm performance. For the smaller market structures, these findings on the effects of entry on competition are in line with Asplund and Sandin (1999) and Bresnahan and Reiss (1991). However, in contrast to these studies, we still find threshold ratios significantly above one for the larger market structures, indicating that an additional entry in markets which already have two or three stores still increases the extent of competition. Unlike these studies, competition has not yet reached perfectly competitive levels upon the fourth entry. Our findings imply that the models of contestable markets (in which a monopoly is sufficient for perfect competition) or of perfectly sustainable collusion

can be rejected. In addition, the Bertrand model with homogeneous products can also be rejected (since that model would imply that all the effects of entry on competition would take place upon entry in a monopoly market).

The observed pattern of the entry-threshold ratios gives interesting additional findings. We tested whether the consecutive per-firm entry-threshold ratios differ significantly from each other, i.e. whether $R^{n-1} = R^n$. As shown in the third panel of Table 5, the first entry-threshold ratio R^2 is significantly smaller than R^3 ($\chi^2(1) = 4.20, p = 0.04$), implying that a shift from monopoly to duopoly has a lower impact on competition than a shift to a market structure with three firms. The second and third ratios do not differ significantly from each other ($\chi^2(1) = 0.33, p = 0.57$). This pattern is inconsistent with traditional models of oligopolistic competition, such as the Cournot model or Bertrand model with differentiated products, which have the property of smoothly declining entry-threshold ratios. The pattern is, however, consistent with models with imperfectly sustainable collusion. Recent experimental research by Huck, Normann and Oechssler (2004) has shown that collusion can be sustained in a duopoly, while it is never observed in market structures with more firms. They hereby confirm the general belief that cooperative behavior could be expected in small groups, whereas in large groups non-cooperative behavior could prevail, as cooperation is harder to sustain as the number of firms grows. Our estimated threshold ratios are consistent with this pattern. The entry-threshold ratio is largest when shifting from a duopoly market to a market with three firms (ratio = 1.32). The underlying mechanism of this finding may be that a certain degree of cooperative behavior in the duopoly is broken down when the third firm enters the market, causing an increase in the degree of competition. Another possible explanation for our finding could be the existence of two different customer types. This would imply that the first and second entrant may largely serve different customers, while the

third may need to steal customers from both players, hence increasing the amount of competition in the market more substantially.⁸

Our main findings on the extent of competition, as summarized by the entry-threshold ratios R^n , remain very robust in the second and third specification, which include the effect of market-specific control variables in, respectively, the full and limited (Wallonia only) sample. Indeed, even though the control variables somewhat affect the estimated threshold values (i.e. the S^n), the threshold ratios (i.e. the R^n), which are central to our inferences on the extent of competition, are very robust across specifications. The threshold ratios are still significantly above one. The only exception is the entry-threshold ratio when shifting from a monopoly to a duopoly in the third specification. Even though the threshold is still above one (and of comparable magnitude), it no longer reaches statistical significance. This can, however, be attributed to the lower number of observations in the more limited Wallonia sample. Furthermore, the threshold ratio for adding a second store R^2 is significantly below the entry threshold for adding a third store R^3 in both specifications ($\chi^2(1) = 6.12, p = 0.01$ and $\chi^2(1) = 2.87, p = 0.09$ for specification (2) and (3) respectively). Finally, it is still the case that R^3 is not significantly different from R^4 ($\chi^2(1) = 0.19, p = 0.66$ in both cases).

5.2. Market-specific variables

Specification (2), for the full sample, and specification (3), for Wallonia only, include the market-specific variables outlined in section 3.2.. As indicated before, their inclusion did not affect our substantive implications on the nature of competition.

In line with earlier findings from the channel (e.g. Lehmann & Weinberg, 2000) and micro-marketing literature (e.g. Campo et al., 2000; Hoch et al., 1995), we find that both the presence of substitute channels and various socio-demographic variables have an important

⁸ We are indebted to an anonymous reviewer for pointing out this alternative explanation.

effect on store performance. Specification (2) in Table 4 shows that the addition of these market-specific effects increases the model fit (*pseudo R*² of 0.39 instead of 0.37 in the first specification). A likelihood-ratio test shows a highly significant joint effect of the control variables ($p < 0.001$). Specification (3), for the sample of Wallonia only, again shows that the fit increases when the control variables are included. A likelihood-ratio test confirms that the controls are again jointly significant ($p = 0.001$).

5.2.1. Presence of substitute channels

Specification (2) in Table 4 shows that the presence of an upward channel, i.e. a nearby movie theatre, has a significantly negative impact on the performance of video stores (point estimate of $\gamma_{Theatre}$ is -0.17 , $p = 0.03$). This result extends previous work by Lehmann and Weinberg (2000). They found cannibalization effects from earlier theatre visits on the subsequent rental performance of the same movie. Our results show that the cannibalization effect of movie theatres extends beyond this direct (same-movie) effect, and affects the overall performance of video stores in the theatre's trading zone.

To better interpret this effect, one may compute the entry-threshold levels S^n separately for markets with and without a movie theatre.⁹ The computations show that the market size required to support a monopoly video store when a movie theatre is present is equal to 4,797 inhabitants as opposed to 4,256 when this is not the case. Similarly, the market size required to support a duopoly when a movie theatre is present is equal to 10,309 inhabitants, and 9,147 if this is not the case.

Finally, one can also re-interpret the movie-theatre parameter $\gamma_{Theatre}$ more compactly as the percentage market-size increase required for a particular number of firms to break even

⁹ Our estimates of threshold values S^n in Table 5 were based on a representative average market, with an average movie-theatre presence equal to 0.72. Our calculations in this paragraph separately distinguish between markets with and without a movie theatre.

if a movie theatre is present (independent of whether this occurs in a monopoly, duopoly or otherwise). The parameter estimate of -0.17 implies that the percentage market-size increase required to support any market structure in the presence of a movie theatre is 13%.¹⁰

Apart from an effect of upward channels, however, a video store may also be affected by channels more downward in the distribution channel, as discussed in section 3.2.1.. We assessed the impact of premium cable on video-store performance using the Wallonia sample only ($n = 1,338$), since data on the number of subscriptions to premium cable was only available for this region. The third specification in Tables 4 and 5 shows the results. As indicated before, the substantive results on competition are essentially robust. For the role of the downward channel, we look at the parameter estimate for premium cable. We find that the percentage of households with a subscription to premium cable does not have a significant effect on the performance of video stores (point estimate of 1.01, $p = 0.45$). Hence, there appears to be no cannibalization by the downward distribution channel, in contrast with our finding on the upward distribution channel. The absence of an effect from the downstream channel (premium cable) shows that customers do not postpone their purchase in anticipation of a price decrease, as was suggested by Purohit (1997). This is a reassuring finding for movie studios, as their margin is largest for channels highest in the sequence (Doyle, 2002).

5.2.2. Socio-demographic variables

Specification (2), for the full sample, and specification (3), for Wallonia only, include socio-demographic variables. As indicated before, their inclusion did not affect our substantive implications on the nature of competition.

¹⁰ This can be derived by computing the ratio of threshold values S^u with and without a movie theatre. It is straightforward to derive that this ratio is given by $\exp(-\hat{\gamma} / \hat{\alpha}) = \exp(0.17 / 1.39) = 1.13$.

We base our discussion regarding the socio-demographic variables on specification (2).¹¹ The effect of *income* appears to be dual. Both markets with many low-income families and markets with many high-income families are associated with a significantly lower video-store performance, as compared to markets with more intermediate-income families ($p = 0.01$ and 0.05 , respectively). For families at the lower tail of the income distribution, the traditional income effect may hold: they may have to cut back on entertainment and spend their income on necessary goods. For the higher incomes, the substitution effect comes into play. They may spend their budget on more expensive forms of entertainment. The latter finding is in line with recent industry reports that conclude that high-income segments have a lower propensity to rent videos (VSDA, 1998). *Larger families* appear to spend more on video rental ($p = 0.03$). As larger families are typically families with children, this result is consistent with industry reports that found that families with children rent far more videos than other households (VSDA, 1998). The percentage of *foreigners* in a market has a negative influence on video-store profit ($p = 0.02$). This confirms our prior argumentation that foreigners may face economic, cultural or linguistic barriers that prevent them from renting videos. *Elderly* increase the profitability of a video store, as is indicated by the significant positive effect of the percentage of older people ($p < 0.001$), which may be explained by their typically larger amount of leisure time (Vogel, 2001). In line with the findings of industry reports (VSDA, 1998), people in *urban* surroundings rent more videos, thereby increasing video-store profitability ($p = 0.02$). Finally, also *regional differences* turn out to be important, as the parameter associated with this control variable was highly significant ($p < 0.001$).

¹¹ Most of these findings are robust when only the results for the limited sample of Wallonia are considered, even though some of the demographic effects become insignificant due to the reduced number of observations. Specifically, the effect of age and the degree of urbanization remain significant, while both the effects of household size and the percentage of foreigners are comparable in sign and size to the results from the larger sample.

6. CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Local-service sectors have been largely neglected in the widely-studied field of competitive interactions. This may be attributed to the fact that detailed data gathering in these sectors is typically difficult because of the multitude of players, and the fact that key service components are hard to quantify. An empirical entry model is proposed to study competition in local-service sectors by inferring information on the profitability and the degree of competition from observed entry decisions of firms in local markets. This approach, which imposes very few data demands, does not only allow us to infer information on the relative degree of competition in different market structures, but also to measure the effect of up- and downstream substitute channels, as well as of various socio-demographic factors.

In our application on the Belgian video-rental market, we find that competition increases with every entry, including when entry occurs in a duopoly and a market with three incumbents. However, contrary to predictions from most traditional economic models, we find that this increase is larger when entry occurs in a duopoly than in a monopoly. The observed pattern is consistent, however, with recent experimental research on collusion in oligopolies by Huck et al. (2004). It could also point at the existence of two customer groups served by, respectively, the first and second entrant. More research is needed to distinguish between both explanations.

We also find evidence for a negative effect of the presence of an upstream channel (movie theatre). Premium cable, on the other hand, does not impact video-store performance significantly. In line with the micro-marketing literature, we also find that socio-demographic characteristics of the local market have an important effect on store performance. Specifically, we find that the percentage of both low-income and high-income families have a negative effect on video-store performance. Also the percentage of foreigners was found to

influence video-store performance negatively. Larger families and families in urban surroundings, on the other hand, are found to rent more movies.

Our framework allows us to infer the nature of competition in local-service markets without very stringent data requirements. In so doing, some assumptions were made which could be relaxed in future research. First, as indicated in section 2.1., firms in a given market are assumed to be homogeneous. Despite the fact that video stores offer a relatively homogeneous product, store organization as well as economies of scale in inventory management and/or advertising could result in different demand and cost structures between independent and chain-affiliated video stores (Seim 2001). However, our homogeneity assumption may still be valid in most European countries where video chains are limited in size (number of stores). In Belgium, for example, the largest chain has only 60 stores, which is hardly comparable to American chains as Blockbusters and Hollywood Entertainment with, respectively, 5,000 and 1,800 video stores (Seim, 2001). We tested the robustness of our substantive results on competition by dropping all markets where at least one of the major chains is present. The results turned out to be robust. Still, more research is needed to relax this assumption when chains get larger. In principle, one could follow the approach of Mazzeo (2002), and explicitly account for different types of video stores (independent versus chain-affiliated stores). For this particular application, however, this did not provide a feasible option, as very few stores belong to a chain (only 8% of all Belgian video stores). This would imply very limited variation across different market-structure combinations (as defined by the number of stores of each type).

Second, the various markets in our sample are assumed to be non-overlapping. To that extent, we omitted larger cities from our sample, and focused on townships, rather than the larger municipalities, as relevant geographical entity. However, some overlap may still exist in a number of instances; for example, when transient shoppers patronize video stores on

their route to work rather than in their home's township. To mitigate this effect, one could follow Bresnahan and Reiss (1991), and include socio-demographic characteristics of the neighboring townships as additional control variables in Equation (5).

Third, as the data used in this analysis are cross-sectional, we could not control for unobserved market-specific effects. We did, however, perform additional robustness checks on this matter, adding (i) a number of extra socio-demographic variables, and (ii) fixed effects for the 10 Belgian provinces. The substantive results on competition were robust. Studying these effects with panel data could provide interesting further insights.

Fourth, the nature of competition is inferred under a long-term free entry equilibrium condition. This assumption is reasonable for mature industries such as the video-rental sector. In future research, it would be interesting to extend the modeling approach to consider the dynamics underlying the entry process.

A final avenue for future research involves the application of our framework to other countries and/or other local-service sectors (such as restaurants and hotels), which would allow one to see whether some of our substantive implications on the nature of competition and the effects of the included control variables are idiosyncratic to this specific setting, or form the onset of empirical generalizations.

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TABLES

Table 1: Comparison of Belgium with Western Europe

	Belgium	Western Europe ^(c)
<i>Macro-economic indicators</i>		
GDP/capita (2002, \$) ^(a)	23,768	23,285
Wholesale, retail trade, restaurants, hotels as % of GDP (2002) ^(a)	12%	13%
<i>Video-rental statistics</i>		
VCR penetration (2002, % of TV households) ^(b)	79%	79%
DVD-player penetration (2002, % of TV households) ^(b)	17%	18%
Spending on video rental per TV household (2002, \$) ^(b)	21	18
Number of rental transactions per TV household (2002) ^(b)	6	5
Average rental charges (2002, \$) ^(b)	3.2	3.6

(a) United Nations Statistics.

(b) Own calculations based on numbers from the European Video Yearbook 2003, published by the International Video Federation (IVF).

(c) Following the IVF, we define Western Europe as the 15 countries of the European Union at the end of 2000, together with Iceland, Norway and Switzerland.

Table 2: Number of observations per market structure

Video Stores in Market	Number of Local Markets (percentage)	
0	1,921	(80%)
1	276	(12%)
2	120	(5%)
3	40	(2%)
4+	33	(1%)
Total	2,390	(100%)

Table 3: Descriptive statistics

Variable	Number of observations	Mean	Standard Deviation	Minimum	Maximum
<i>Substitute channels</i>					
(Movie) Theatre	2,390	72% ^(a)			
Premium Cable	1,338 ^(b)	19%	5%	0%	35%
<i>Socio-demographic characteristics</i>					
Population	2,390	3,030	4,433	14	41,481
Low Income	2,390	23%	4%	15%	37%
High Income	2,390	27%	5%	14%	42%
Household size	2,390	2.49	0.14	2.03	2.93
Age	2,390	16%	3%	7%	37%
Ethnicity	2,390	4%	5%	0%	59%
Urbanization	2,390	21% ^(a)			
Region	2,390	43% ^(a)			

(a) Dummy variables. We report the proportion of observations having the value 1.

(b) Information on premium-cable subscriptions applies only to townships in Wallonia. In addition, data were missing for 22 Walloon townships.

Table 4: Estimated parameters of expected-profit functions^(a)

Coefficient	Specification		
	(1)	(2)	(3)
$\alpha_{\log(\text{Population})}$	1.23*** (0.04)	1.39*** (0.05)	1.18*** (0.07)
λ^1	2.02*** (0.07)	3.13*** (1.09)	4.85*** (1.56)
λ^2	3.03*** (0.09)	4.19*** (1.10)	5.80*** (1.56)
λ^3	3.87*** (0.11)	5.08*** (1.10)	6.65*** (1.57)
λ^4	4.49*** (0.14)	5.74*** (1.10)	7.45*** (1.58)
γ_{Theatre}	-	-0.17** (0.09)	-0.16* (0.13)
$\gamma_{\text{Premium Cable}}$	-	-	1.01 (1.33)
$\beta_{\text{Household size}}$	-	0.78** (0.35)	0.72 (0.56)
$\beta_{\text{Low Income}}$	-	-3.58*** (1.42)	-0.58 (1.83)
$\beta_{\text{High Income}}$	-	-2.10** (1.06)	0.20 (1.70)
β_{Age}	-	5.48*** (1.48)	8.23*** (1.99)
$\beta_{\text{Ethnicity}}$	-	-1.63** (0.70)	-0.41 (1.04)
$\beta_{\text{Urbanization}}$	-	0.22** (0.09)	0.27** (0.14)
β_{Region}	-	-0.67*** (0.10)	-
Pseudo R ²	0.37	0.39	0.36
Number of observations	2,390	2,390	1,338

(a) Standard errors between parentheses. *, ** and *** indicate a significant result at, respectively, 10%, 5% and 1% significance level. Reported significance tests are two-tailed, except for the effect of movie-theatre presence.

Table 5: Estimated threshold values (S^n) and ratios (R^n)

	Specification		
	(1)	(2)	(3)
Threshold values			
S^1	5,198	4,638	4,386
S^2	11,837	9,969	9,829
S^3	23,400	18,922	20,106
S^4	38,755	30,597	39,744
Threshold ratios^(a)			
R^2	1.14*** (7.29)	1.07* (2.67)	1.12 (2.03)
R^3	1.32*** (17.62)	1.27*** (14.91)	1.36*** (6.87)
R^4	1.24*** (6.96)	1.21*** (6.21)	1.48** (4.07)
Test on ratios^(b)			
$R^2 = R^3$	4.20**	6.12***	2.87*
$R^3 = R^4$	0.33	0.19	0.19

(a) Numbers between parentheses are the Wald test statistics for the null hypothesis that the ratio equals one. *, **, *** indicate significant effects at the 10%, 5% and 1% level.

(b) Numbers are the Wald test statistics for the null hypothesis that two consecutive ratios are equal to each other. *, **, *** indicate significant differences at the 10%, 5% and 1% level.