Thorsten Hennig-Thurau, Victor Henning, & Henrik Sattler

Consumer File Sharing of Motion Pictures

Illegal consumer file sharing of motion pictures is considered a major threat to the movie industry. Whereas industry advocates and some scholars postulate a cannibalistic effect on commercial forms of movie consumption, other researchers deny this effect, though sound evidence is lacking on both sides. Drawing on extant research and utility theory, the authors present hypotheses on the consequences and determinants of consumer file sharing and test them with data from a controlled longitudinal panel study of German consumers. The data contain information on the consumers' intentions toward and actual behavior in relation to the consumption of 25 new motion pictures, allowing the authors to study more than 10,000 individual file-sharing opportunities. The authors test the effect of file sharing on commercial movie consumption using a series of ReLogit regression analyses and apply partial least squares structural equation modeling to identify the determinants of consumer file sharing. They find evidence of substantial cannibalization of theater visits, DVD rentals, and DVD purchases responsible for annual revenue losses of $300 million in Germany. Five categories of file-sharing behavior drive file sharing and have a significant impact on how consumers obtain and watch illegal movie copies.

E ver since the ascent of Internet file-sharing services and the parallel sharp decline of the music industry's worldwide sales, movie executives have feared that their industry would be similarly affected by illegal file sharing (*The Economist* 2002). Recent figures show that approximately 130,000 movies are downloaded each day through file-sharing networks in the United States alone (Motion Picture Association of America [MPAA] 2004a), and movie theater admissions in 2005 fell by 9% in the United States and even more in other major markets. Against this backdrop, the MPAA (2004b) claims that "illegal movie trafficking represents the greatest threat to the economic basis of moviemaking in its 110-year history," and it has declared "war on piracy" (Fritz 2005).

However, sound evidence for the proclaimed effect of file sharing on movie consumption is lacking. A multitude of industry reports postulates a cannibalization effect of file sharing on movie industry revenues, but the results of academic studies are inconclusive. No peer-reviewed article has yet investigated the effects of movie file sharing on commercial distribution channels, and the limited work that reports a negative effect of music file sharing on legal music consumption uses highly abstract proxies, such as "Internet penetration," to measure consumer file sharing (e.g., Liebowitz 2006). At the same time, some researchers argue that file sharing does not damage the (music) industry and provide empirical (Oberholzer-Gee and Strumpf 2005) and theoretical (Gopal, Bhattacharjee, and Sanders 2005) arguments for the absence of a cannibalization effect—or even the presence of a positive effect of file sharing on legal consumption.

We shed light on this controversial issue by employing controlled longitudinal panel data from 770 to 813 consumers that encompass information on more than 10,000 movie file-sharing opportunities. We use this data to investigate whether illegal movie file sharing influences revenues generated through theatrical visits, DVD rentals, and DVD purchases and, if so, how strong the effects are. In addition, we present—to our knowledge, for the first time—a comprehensive, theory-based model of the factors that drive consumers' movie file-sharing activity. This model offers the movie industry a more thorough understanding of why consumers engage in file sharing, suggesting more effective antipiracy strategies.

We structure the rest of the article as follows: After reviewing the relevant literature, we derive a set of hypotheses regarding the consequences and determinants of movie file sharing from extant research and utility theory. We then report our data set and use ReLogit regression analysis and partial least squares (PLS) structural equation modeling to test the hypotheses. We conclude by discussing the results and implications.

Motion Picture File-Sharing Literature

File-Sharing Consequences

Industry representatives unanimously argue that illegal motion picture file sharing has a negative impact on other

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kinds of movie consumption, and industry-commissioned studies, such as those of the German Federal Film Board (hereinafter FFA) (2006) and MPAA (2004c), support their claims. For example, in a study of movie piracy by the FFA (2006), respondents indicated how movie downloading or copying movies with a CD/DVD burner influenced their consumption of motion pictures through other channels. Of the respondents, 42% reduced their number of movie theater visits (though 8% stated they went to the movies more often), 45% said they rented fewer DVDs, and 44% replied that they bought DVDs less often. Similarly, the findings of an eight-country study commissioned by the MPAA (2004c) indicate that "about one in four Internet users (24%) have downloaded a movie" (MPAA 2004c, p. 1) and that, on a global level, 26% of downloaders purchase movies "much less" or "a little less" often than in the past (excluding Korea, the outlier, lowers the unweighted mean from 26% to 14%). The insights generated by these and other industry studies are limited by their methodological approaches and lack of transparency. In all cases, the results rely on an *ex post* "what-if" approach that asks consumers who have already seen movies as illegal copies (and therefore know the cinematic quality) to speculate whether they would have paid for the movies if they had not been available as illegal copies.

To the best of our knowledge, no scholarly research has addressed the effects of sharing illegal movie copies on commercial distribution channels. In the related context of music file-sharing studies, researchers are split into two opposing groups. The first group reports a negative impact of music file sharing on industry sales (Liebowitz 2006; Michel 2006; Montoro-Pons and Cuadrado-García 2006; Peitz and Waelbroeck 2004; Zentner 2006), but these studies all rely on aggregate household Internet penetration in a given city as a proxy for file sharing and do not monitor file sharing on an individual basis. Therefore, this approach raises serious questions regarding spurious correlations and paves the way for alternative explanations.

The second group of researchers questions these findings and argues that file sharing has either no impact or a positive impact on industry revenues. Specifically, Gopal, Bhattacharjee, and Sanders (2005) propose a model of online music-sharing economics and derive implications for consumer surplus and producer profits. Following the train of thought that consumer file sharing represents a form of "sampling" for experience goods, they conclude that file-sharing networks lower the total costs of evaluating and acquiring experience goods, which increases purchases and industry profits. In other words, file sharing reduces consumers' risk in evaluating new music (an argument that easily extends to movies), a major obstacle in consumer decision making.

Using a different argument, Boldrin and Levine (2002) and Grgeta (2004) model competition with sunk costs and argue that, with certain assumptions, the decreasing costs of reproduction that result from file sharing make it easier, not more difficult, for the producer to recoup his or her investment and that as the rate of reproduction increases,

competitive rents increase. Their conclusion is based on the concept of indirect appropriability, which assumes that an original product attains greater consumer utility when it can be copied and that this utility increase can be captured by the producer through a price increase. However, similar to Gopal, Bhattacharjee, and Sanders (2005), these researchers do not provide empirical findings to substantiate their conclusions.

Oberholzer-Gee and Strumpf (2005) present empirical results that show no negative impact of file sharing on traditional music distribution channels. Over the course of four months, they monitor 1.75 million file downloads on file-sharing networks and then match the downloads to U.S. album sales data. Their empirical analysis shows that music file sharing has no significant impact on album sales. Again, however, the generalizability of their findings is somewhat limited because the authors use the "number of German school kids on vacation" as an instrumental variable for file-sharing activity to bypass endogeneity problems caused by the simultaneity of downloading and purchasing activity in their aggregate level data.

To summarize, movie industry representatives argue that file sharing serves as a substitute for commercial movie consumption, but no peer-reviewed research has studied this relationship for movies, and the results from music file-sharing research are inconclusive and limited by methodological constraints. Moreover, no existing study has surveyed actual consumer decision making on an individual level, and no study has used longitudinal data.

File-Sharing Determinants: Rochelandet and Le Guel's Model

Related to the consequences of movie file sharing for commercial channels are the factors that drive consumer file sharing. Research into these factors is also rare; we are not aware of a single academic study that directly addresses this question. Again, some scholars have researched file-sharing determinants in the related context of music. Most authors focus on the role of individual constructs for file sharing (e.g., ethical predispositions [Gopal et al. 2004]; consumer expertise, social networking, and moral judgments [Huang 2005]), whereas Rochelandet and Le Guel (2005) attempt to integrate different drivers of sharing illegal music copies in a comprehensive model.

Building on the Beckerian consumer utility framework, Rochelandet and Le Guel (2005) propose that consumers prefer illegal copies of music over the original product (i.e., a CD) when consuming the illegal copy offers greater utility. More specifically, they argue that three groups of factors influence consumers' utility perceptions of the original and the illegal copy: (1) the utility derived from buying an original (including both gross utility and costs), (2) the costs of the illegal copy (mainly transaction costs), and (3) the degree of substitution between an original and its illegal copies. Rochelandet and Le Guel find partial support for their model from a convenience sample of 2500 French consumers. With an ordered logit approach, the factors in their model explain 10% of the music file-sharing intensity.

Consequences and Determinants of Motion Picture File Sharing

Motion Picture File Sharing as the Focal Construct

We define the file sharing of motion pictures as consumers' consumption of illegal copies of full-length motion pictures. This definition considers not only watching but also the mere act of obtaining illegal movie copies as forms of consumption. Although these two behaviors are closely related, they are conceptually distinct because consumers do not necessarily watch every illegal copy they obtain. Our use of the phrase "illegal copies" excludes original movies that consumers have the legal right to watch, such as those made available by their copyright owners to file-sharing networks or Internet video forums, such as YouTube, and commercial video-on-demand services, such as Movielink. Finally, our conceptualization of file sharing involves not only accessing illegal movie copies from file-sharing networks ("Internet piracy") but also the personal exchange of illegal movie copies among consumers (e.g., on CD-Rs and DVD-Rs; "hard goods piracy"); this is consistent with the conceptualization of movie file sharing used by the movie industry (MPAA 2006).

The Effects of Motion Picture File Sharing on Commercial Channels

Consistent with a consumer utility perspective of file sharing (Rochelandet and Le Guel 2005), we propose the existence of negative (i.e., cannibalistic) effects of movie file sharing on movie consumption in the three key commercial channels: theater visits, DVD rentals, and DVD sales (e.g., Liebowitz 2006; MPAA 2004c). In all three channels, we distinguish among three related but distinct potential cannibalization effects.

The first hypothesized effect refers to consumers' intentions to watch an illegal copy of a movie. We propose that when a consumer has such intentions, he or she is less susceptible to offers from theaters, DVD rental outlets, and DVD retailers because his or her intention to watch an illegal copy usually entails the expectation to obtain a copy of the movie for free instead of paying for it through legal channels. As a consequence, the consumer will refrain from using those commercial channels. This should be the case regardless of whether the consumer actually obtains an illegal copy of the movie.

> H_1: A consumer's intentions to watch an illegal movie copy reduce the probability that the consumer will (a) watch the movie in a movie theater, (b) rent the movie on DVD, or (c) purchase the movie on DVD.

The second hypothesized effect refers to a consumer's actual obtainment of illegal movie copies. Here, we argue that consumers who have gained access to an illegal copy of a movie have a lesser probability of seeing the movie in a theater or on DVD, regardless of (1) their original intentions toward watching an illegal copy of the movie and (2) whether they actually watch the illegal copy. Distinguishing between consumers' intentions and their actual behaviors is

important from a managerial perspective because if intentions influence commercial channel usage, the movie industry should focus its antipiracy activities on consumers who intend to watch a copy. In contrast, if actually obtaining illegal copies harms movie theaters and other channels, it is the copies that should be the focus of the industry's antipiracy actions because any obtained copy would cannibalize commercial channels regardless of the consumers' intentions.

> H_2: For a given level of file-sharing intentions, a consumer's obtainment of an illegal movie copy reduces the probability that the consumer will (a) watch the movie in a movie theater, (b) rent the movie on DVD, or (c) purchase the movie on DVD.

The third hypothesized effect is related to the consumer's watching of illegal copies. We postulate that consumers who watch an illegal movie copy have a lesser probability of seeing that movie in a theater or on DVD, regardless of their original intentions toward watching an illegal copy of the movie. Whereas our second hypothesis factors out what happens after the consumer obtains a copy, our third hypothesis posits that the specific act of watching the copy cannibalizes revenues. The relevance of this hypothesis stems from its associated managerial implications; specifically, it suggests that antipiracy actions should be directed toward preventing consumers from watching illegally obtained movie copies.

> H_3: For a given level of file-sharing intentions, a consumer's watching of an illegal movie copy reduces the probability that the consumer will (a) watch the movie in a movie theater, (b) rent the movie on DVD, or (c) purchase the movie on DVD.

Determinants of Motion Picture File Sharing

When modeling the determinants of movie file sharing, we build on Rochelandet and Le Guel's (2005) utility theory approach but substantially refine and extend this approach in several ways. In general, we distinguish among five categories of factors that we expect to drive consumers' movie file-sharing behavior: perceived degree of substitution between an original movie and its illegal copies, utility of the original, (transaction) costs of the illegal copy, specific utility of the copy, and a consumer's file-sharing knowledge. The first three categories come from Rochelandet and Le Guel, and the last two are unique to this study. We discuss the categories and the individual drivers they encompass next and summarize them in Figure 1.

Degree of substitution. A direct implication of the utility theory approach is that the degree to which a consumer perceives illegal movie copies as providing the same utility as watching the original movie in a theater or on DVD determines the intensity of consumer file sharing. This perceived degree of substitution influences the utility of the illegal copy (Rochelandet and Le Guel 2005) and therefore should have a positive effect on the intensity with which consumers obtain and watch illegal movie copies.

> H_4: The degree to which a consumer judges illegal movie copies as substitutes for movies in commercial channels

FIGURE 1

Structural Model of File-Sharing Determinants
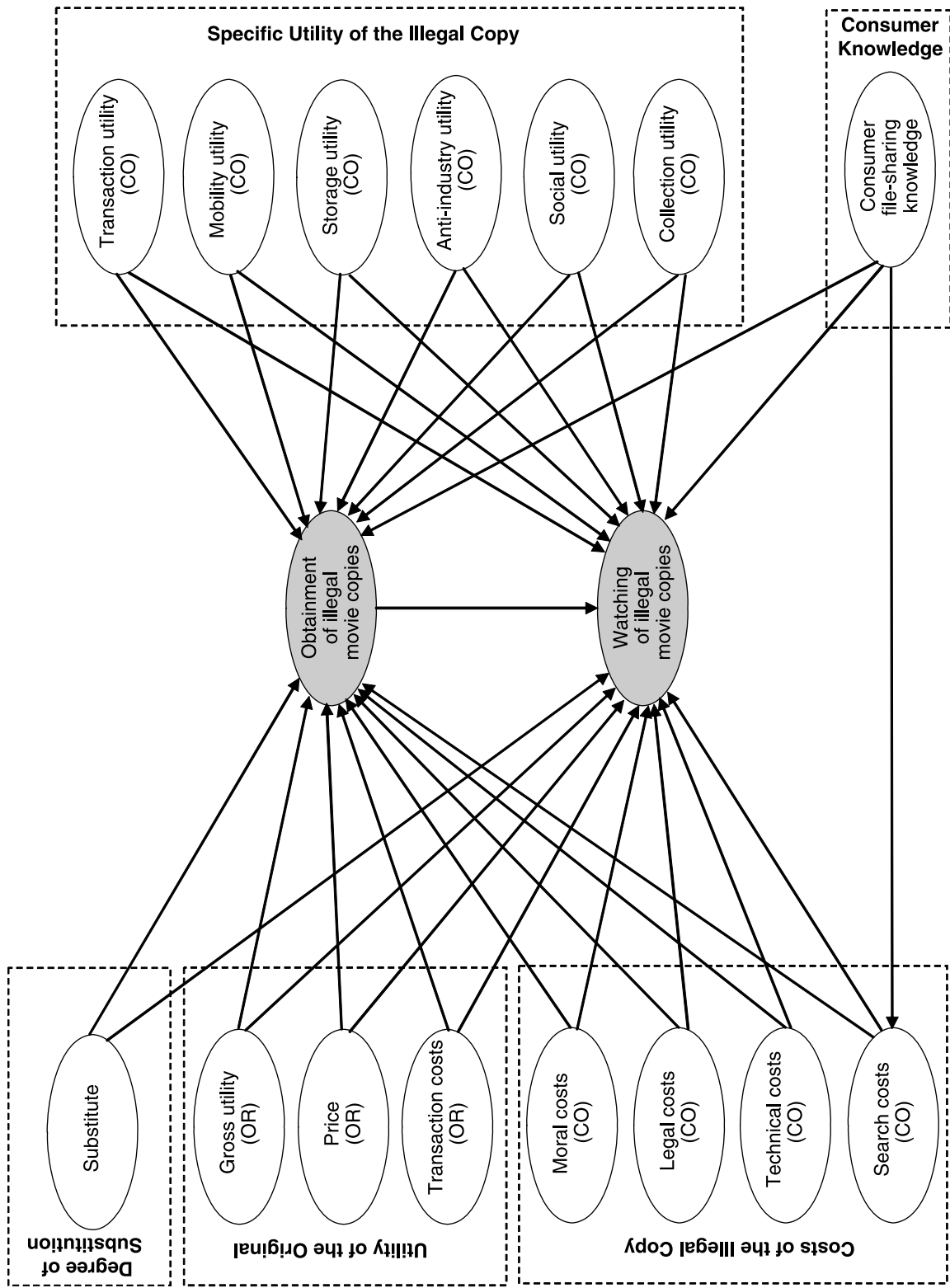
Notes: CO = illegal movie copy, and OR = original movie.

correlates positively with the number of illegal movie copies a consumer obtains and the number of illegal copies he or she watches.

Utility of the original. A consumer's demand for illegal movie copies as substitutes of original entertainment offers is a function of the gross utility that the consumer expects to receive from watching an original movie in a theater or on DVD. Specifically, for a given degree of substitution, the original's higher gross utility will result in more illegal movie copies being obtained and watched by consumers (Rochelandet and Le Guel 2005).

Furthermore, the utility theory approach implies that the costs associated with consuming an original movie also determine the original's net utility (Rochelandet and Le Guel 2005). These costs consist of the perceived price of the original and the perceived transaction costs associated with its consumption (e.g., paying for a babysitter when going to the theater). Because these costs decrease the relative attractiveness of the original compared with the illegal copy, they should correlate positively with the number of illegal movie copies obtained and watched by the consumer for a given degree of substitution.

> H_5: The perceived (a) gross utility and (b) costs of the original movie correlate positively with the number of illegal movie copies a consumer obtains and the number of illegal copies he or she watches.

Costs of the illegal copy. Because consumers usually acquire illegal copies without paying a fee, the costs of obtaining and/or watching an illegal movie copy mainly consist of transaction costs. These transaction costs comprise moral costs (e.g., ethical concerns about stealing copyrighted material; Holm 2003), legal costs (e.g., fear of sanctions; Chiang and Assane 2002), technical costs (e.g., potential file misspecifications or viruses that could harm the consumer's computer), and search costs (e.g., time spent looking for an illegal copy) (Rochelandet and Le Guel 2005). Transaction costs reduce the attractiveness of the illegal copy compared with the original and should have a negative effect on obtaining and watching illegal movie copies.

> H_6: The perceived transaction costs of the illegal copy correlate negatively with the number of illegal movie copies a consumer obtains and the number of illegal copies he or she watches.

Specific utility of the illegal copy. We expand on the utility theoretic approach and argue that consumers sometimes prefer an illegal movie copy because copies can provide them with specific utilities that they cannot gain by consuming the original movie. In other words, we expect that some consumers obtain and/or watch an illegal movie copy to gain a specific utility they cannot access by watching the movie in a theater or on DVD.

To develop a more thorough understanding of the specific utilities of illegal movie copies, we conducted eight qualitative, largely unstructured, in-depth interviews with experienced movie file sharers. The interviews lasted 25–45 minutes and suggested six specific file-sharing utilities,

which we propose positively influence consumers' movie file-sharing activity:

1. *Transaction utility.* Illegal movie copies enable consumers to "make a deal" and save money compared with consuming the same movie through commercial channels. According to Thaler (1985, p. 205), such a deal can result in a transaction utility that refers not to the value of the consumed good (i.e., the movie) but to "the perceived merits of the 'deal'" or, in other words, the customer's satisfaction and pleasure of obtaining the financial advantage associated with the copy (Grewal, Monroe, and Krishnan 1998).

2. *Mobility utility.* Illegal copies enhance consumers' mobility because they can be stored on mobile devices (e.g., laptop computers, video iPods, personal digital assistants), which enables consumers to carry extensive movie libraries in a minimal space when traveling. Because this mobility is not possible with regular DVDs, it represents a specific utility of the copy to consumers.

3. *Storage utility.* Related to the second point, because of the nonphysical character of illegal copies, they require less physical storage space in the consumer's domicile than purchased DVDs, which can represent a benefit for consumers.

4. *Anti-industry utility.* The movie industry receives frequent consumer criticism for its treatment of movies as mere commercial products rather than as art, as well as for the prices it charges for movies in legal channels (e.g., Graham 2004)—an attitude that is shared by certain industry insiders (e.g., director M. Night Shyamalan calls studios "greedy, heartless, soulless, and disrespectful"; *Guardian Unlimited* 2005). Consumers might consider "stealing" a movie by watching an illegal copy a legitimate kind of revenge on the industry and derive a benefit from this.

5. *Social utility.* Accumulating illegal movie copies enables consumers to establish social links with relevant others. Consumers can interact with their peers about illegal movie copies and related technology and thus become part of a "social copying network." This allows the consumers to demonstrate their expertise and receive social rewards for that expertise from others. Huang (2005) provides initial empirical support for such social utility.

6. *Collection utility.* The availability of illegal movie copies enables consumers to collect large numbers of movies, regardless of their financial resources. Consumer behavior literature reports that consumers derive a utility from such collecting behavior beyond the products' functional value, and this collection utility has the potential to influence behavior (Belk 1995).

> H_7: The specific utility a consumer derives from an illegal movie copy correlates positively with the number of illegal movie copies the consumer obtains and the number of illegal copies he or she watches.

Consumer file-sharing knowledge. In some situations, consumers are not interested in utility maximization but rather strive to "make a satisfactory choice while minimizing cognitive effort" (Hoyer 1984, p. 823). If so, the consumer's knowledge of a product category enables him or her to minimize decision-making effort but still derive a satisfactory amount of consumption utility. Greater knowledge can reduce the consumer's cognitive effort to the degree that the task "is performed automatically" (Alba and Hutchinson 1987, p. 412). Accordingly, a high amount of file-sharing knowledge should enable consumers to obtain and watch

illegal copies with limited cognitive effort. In addition, consumer file-sharing knowledge is related negatively to search costs (part of transaction costs) because knowledge reduces the time and psychological effort needed to locate an illegal movie copy.

H_8: The consumer's file-sharing knowledge correlates (a) positively with the number of illegal movie copies a consumer obtains and the number of illegal copies he or she watches but (b) negatively with the search costs of the illegal copy.

Testing File-Sharing Consequences

In this section, we test the hypotheses that address the consequences of movie file sharing (i.e., H_1–H_3). We use data from a controlled longitudinal sample and ReLogit logistic regression.

Data Collection and Sample

Understanding the effect of movie file sharing on commercial channel usage requires a controlled longitudinal study design, which avoids biases from a priori differences in movie consumption intentions between file sharers and non–file sharers as well as speculative *ex post* "what-if" questions. We collected information from a quota sample of 1075 German consumers, using gender, age, and occupation as quota criteria. The sample mirrors the German movie-going population in terms of key demographic variables and movie consumption (see Table 1). Respondents filled out three different Internet questionnaires over the course of eight months, for which they used personalized identification numbers, so that we could connect the information provided by a respondent at different points in time and avoid multiple responses on the same questionnaire from the same respondent. Respondents received a present worth €10 for completing all three questionnaires, and we also raffled off additional prizes to participants.

We first contacted participants in February 2006 and asked them about their intentions to watch between 10 and 15 new motion pictures in a movie theater or as an illegal copy. The movies were a subset of a total of 25 movie titles covering all major studio releases in Germany in the following months, with none of the movies having been available in theaters or on DVD at that point. Of the movies, 5 were action films, 5 were comedies, 5 were dramas, 5 were children's movies, and 5 were thrillers (the individual titles appear in Appendix A). Each respondent began by indicating his or her preferred genres and then answered questions with regard to the movies assigned to those genres. The maximum of 15 movies (i.e., three genres) per respondent prevents cognitive overload; we also set a minimum condition of 10 movies (i.e., two genres). Participants viewed a poster of each movie, information about the director and cast, and a short synopsis of the movie's content.

We contacted the respondents for the second time in May 2006, after each surveyed movie had been released in movie theaters but before they were available on DVD for either purchase or rental. In the second questionnaire, we collected information about whether respondents had seen the surveyed movies in theaters and whether they had

TABLE 1
Sample Characteristics

Criterion	Sample	German Movie Consumer Population[b]
Gender (%)		
Female	52.7	51
Male	47.1	49
Age Groups (%)		
≤29	57.1	52
30–39	20.9	20
40–49	8.9	14
≥50	13.1	14
Occupation (%)		
Student/in education	40.8	35
Worker	.7	7
Employee	40.1	36
Civil servant	5.5	6
Self-employed	6.1	3
Homemaker	2.7	3
Pensioner	1.4	10
Other	2.6	—
Movie Consumption (per Year)		
Theater visits	8.2 (6)[a]	5.2
DVD purchases	4.1 (1)[a]	5.2
DVD rentals	10.3 (5)[a]	11.1

[a]Number in parentheses is the median.
[b]Percentages are for 2003 (FFA 2004); more recent data are not available for individual categories.

obtained and/or watched illegal copies of the movies. Respondents also indicated whether they intended to rent and/or buy certain movie titles on DVD after these DVDs became available and whether they intended to watch illegal copies of the movies. For the second questionnaire, 813 panel members responded, for a satisfactory retention rate of 76%.

Finally, the third questionnaire followed in October 2006, after 18 of the 25 surveyed movies had been available on DVD for at least four weeks, which reflects the period after studios collect approximately two-thirds of a movie's eventual total DVD rental and sales revenues.[1] This questionnaire primarily assessed respondents' rentals and purchases of the surveyed movies on DVD, and again respondents indicated whether they had obtained and/or watched illegal copies. For this third wave, 770 respondents completed the questionnaire, a 94.6% response rate of the second questionnaire respondents.

Measures of File Sharing and Commercial Consumption

Because file sharing can be a delicate topic, we took thorough actions to ensure that respondents provided valid

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[1]This estimate is based on proprietary information on the weekly revenue distribution of studio movies, which we collected from *Video Business Magazine* (weekly DVD rental revenues) and *Nielsen VideoScan* (DVD purchase revenues).

information about their behavior. We personally promised and gave our word as university professors that all information would be treated strictly confidentially and would not be given to third parties. Moreover, we paid careful attention to the wording of the file-sharing items and avoided describing file sharing as an illegal or immoral activity.

To measure actual file-sharing behavior, we asked each respondent in all three questionnaires whether he or she had (1) obtained a copy of the movie ("Have you obtained this movie as a free copy [either downloaded from file-sharing networks or gained from friends or others]?") and (2) watched the copy ("Have you watched this movie as a free copy [either downloaded from file-sharing networks or gained from friends or others]?").[2] We coded responses as 0 = "no" and 1 = "yes" in both cases. Because each of the 813 respondents to the second questionnaire reported his or her file-sharing behavior for 10–15 movie titles (average number of movies per respondent = 12.65), this sample contains information about $12.65 \times 813 = 10{,}285$ individual file-sharing opportunities. We measured respondents' intentions to watch an illegal copy of a movie by asking the question, "Do you plan to watch this movie as a free copy (either downloaded from file-sharing networks or gained from friends or others)?" They responded on a six-point probability scale (1 = "definitely not," and 6 = "definitely").

To assess consumers' intentions to watch a movie in a theater (first questionnaire), rent it on DVD, or buy it on DVD (both second questionnaire), we employed the same six-point scale as that for consumers' file-sharing intentions. Questions were, "Do you plan to watch this movie in a movie theater?" "Do you plan to rent this movie on DVD?" and "Do you plan to buy this movie on DVD?" Finally, we asked respondents about their actual consumption of the surveyed movies in theaters, on rental DVD, and on retail DVD, which generated three binary variables (0 = "not consumed," and 1 = "consumed").

Descriptive File-Sharing Statistics

Of the 25 movies in our sample, 136 respondents (17%) had obtained at least one illegal copy before the movies were released on DVD; 242 illegal movie copies had been obtained by that time (2.4% of all file-sharing opportunities). Respondents had watched 165 (68%) of these copies. The maximum number of illegal movie copies that respondents obtained before their DVD release was 8 (of 15 surveyed movies). Respondents intended to watch an illegal copy in 21.1% of cases before the movie's theatrical release and in 13.1% of cases before the movie's DVD release (≥ 4 on the six-point file-sharing intention scale).

After the movies had been released on DVD, 141 respondents (18.5%) had obtained at least one copy of a surveyed movie; overall, 342 illegal movie copies had been obtained by the time of the third survey (4.8% of the 7146 file-sharing opportunities), and 66% of those illegal copies had been watched. At this point, the maximum number of illegal movie copies that individual respondents obtained was 11.

Method

We take a binary logistic regression approach to test whether movie file sharing affects theater visits, DVD rentals, and DVD sales. In binary logistic regression, a dichotomous outcome variable Y (the respondents' decision to see a movie through commercial channels) follows a Bernoulli probability function that takes a value of 1 with probability π and 0 with probability $1 - \pi$, where π varies over the observations as an inverse logistic function of a constant and a set of explanatory variables. An often overlooked characteristic of logistic regression is that it is not invariant to the relative frequency of events in the data (i.e., cases in which Y = 1). This is particularly relevant when the number of 1s is small compared with the number of 0s. In this situation, the logistic regression function produces biased logit coefficients that underestimate rare events (i.e., the probability that Y = 1; King and Zeng 2001b). Because the number of cases in which consumers see a movie in a commercial channel is much smaller than the number of cases in which consumers do not, we apply ReLogit regression (King and Zeng 2001a, b). ReLogit regression estimates the same model as a standard logistic regression but corrects for logit coefficient bias and therefore does not underestimate rare event probabilities (Imai, King, and Lau 2006). As an additional benefit, ReLogit uses "prior correction," meaning that it corrects the estimates on the basis of existing information about the fraction of 1s in the population (τ) as part of the maximum likelihood estimation process (King and Zeng 2001b). Prior correction is appropriate for our data, because we asked consumers about movies in their preferred genres (instead of all movies), and the surveyed movies are primarily major studio releases, so that $\pi > \tau$. We calculate the τ parameters on the basis of publicly available information, with $\tau_{\text{Theater}} = .0126$, $\tau_{\text{Rental}} = .0103$, and $\tau_{\text{Purchase}} = .0040$.[3]

Theater-Related Results

To account for potential differences between consumers' obtaining and watching illegal copies, we run three ReLogit models to test the impact of illegal file sharing on movie theater visits. In each model, we include the respondents' intentions to watch an illegal copy of a movie (measured in the first questionnaire) and their actual file-sharing behavior (dichotomous factor, measured in the second questionnaire) as regressors and actual theatergoing behavior as the binary dependent variable. To prevent potential endogenous effects that have troubled previous research on file sharing, we

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[2]None of the surveyed movies were available free of charge in a legal channel when we collected the data.

[3]We calculate τ_{Theater} by dividing the number of theater visits in Germany in 2005 (127.3 million) by the product of the number of movies released in Germany (372) and the number of German movie consumers (27.2 million). This calculation provides the percentage of all moviegoing decisions that lead to a theater visit. Analogously, we calculate τ_{Rental} on the basis of 102.9 million rentals of current feature film DVDs and τ_{Purchase} on the basis of 39.8 million new feature film DVDs sold; there were 369 new feature film DVD releases in 2005. We obtain all data used to calculate the τ parameters from SPIO (2006) and BAM (2006). We find that π_{Theater} is .083, π_{Rental} is .063, and π_{Purchase} is .013. In addition, we apply the Zelig version of ReLogit, which offers minor advantages over other versions.

exclude cases in which theatrical consumption precedes file sharing (n = 10), taking advantage of our individual-level, longitudinal empirical design (in contrast to the aggregate level, cross-sectional design of previous studies). As a result, the independent variables in our ReLogit analyses can be considered unaffected by the dependent variable (i.e., the consumer's theater visit).[4] In the first model (the "overall model"), we set file-sharing behavior equal to 1 when the respondent has obtained an illegal copy, regardless of whether he or she has watched the copy. In the second model, file-sharing behavior is 1 only when the respondent has watched the copy (the "watcher model"); in the third model, file-sharing behavior equals 1 when the respondent has obtained but *not* watched the copy (the "nonwatcher model").

In each model, we control for the impact of the respondents' "true" intentions to watch the movie in a theater—that is, their theatergoing intentions unaffected by file sharing. We correct theatergoing intentions for a potential effect of file sharing by asking respondents who indicated at least a minimum of file-sharing intentions (i.e., >1 on the six-point probability scale) about their moviegoing intention if a copy were not to become available. We asked this question *before* the respondents obtained a specific copy, so respondents were able to consider the situation realistically and make valid predictions. We use the original moviegoing intention score when file-sharing intentions were 1 (i.e., nonexistent).

We also control for several movie characteristics—namely, the number of screens on which a movie was released (a proxy for the studio's marketing efforts; Hennig-Thurau, Houston, and Sridhar 2006), attendance in German theaters (a proxy for word of mouth; Elberse and Eliashberg 2003), and average user rating on the Internet Movie Database (IMDb; a proxy for the valence of word of mouth; Hennig-Thurau, Houston, and Sridhar 2006). We gathered the information for these variables for the surveyed movies from *Variety* magazine and IMDb, respectively.

We report the ReLogit results for the three theater models in Table 2. All models are highly significant and shed substantial light on consumers' theatergoing decisions (Nagelkerke R^2 = .24). With regard to file-sharing intentions, we find a negative effect on theater visits (β values range between –.09 and –.10, and exp[β] is approximately .91), which is significant at $p < .001$ in all three models. That is, an increase in file-sharing intentions reduces the probability that consumers will see a movie in a theater and therefore cannibalizes industry revenues.

With regard to consumers' actual file-sharing behavior, the results are less clear. In the overall model, the null

hypothesis that obtaining an illegal copy does not affect the probability that a consumer will watch a movie in a theater cannot be rejected at the conventional $p = .05$ level. However, at $p = .053$, the risk of wrongly rejecting the null hypothesis is only slightly higher than the traditional cutoff. In the watcher model, the impact of actual file-sharing behavior is significant; that is, we find a negative effect of actual file-sharing behavior on theater visits ($\beta = -.82$, exp[β] = .44). Therefore, when a consumer watches an illegal copy, the probability that he or she will watch the same movie in a theater declines for a given level of file-sharing intentions. Finally, in the nonwatcher model, the impact of actual file-sharing behavior (i.e., obtaining but not watching a copy) is nonsignificant ($p = .91$), with an exp[β] close to 1.

These findings suggest that in addition to the consumer's intention to watch an illegal copy, the act of watching the copy is crucial for the impact of file-sharing behavior. Altogether, our data support H_{1a}, which proposes a negative effect of file-sharing intentions on theater visits, and H_{3a}, which proposes the same effect for watching illegal copies, and the error associated with not rejecting H_{2a}, which proposes that theater visits will be negatively affected by consumers' obtainment of illegal copies, is only slightly greater than .05. As an aside, the corrected theatergoing intentions and three movie characteristics all have the expected significant effects; they increase the probability that a consumer will actually decide to see a movie in a theater.

The ReLogit results enable us to speculate about the strength of the effect of file sharing on theater visits at an overall industry level. In a fictitious situation in which no actual file sharing takes place, though consumers still have file-sharing intentions, the number of theater visits would increase by 1.2% (from 127.5 million to 129 million visits), generating $11.7 million in additional revenue.[5] When actual file sharing is absent and file-sharing intentions are minimal, revenues would increase by 12.6% or $123.1 million compared with the current situation.[6] Although these predictions are restricted by some methodological assumptions, the estimated losses are, by any measure, substantial.

DVD-Related Results

Our approach with regard to DVD rentals and sales is similar to that for theater visits. For each DVD channel, we run three ReLogit models that include respondents' intentions to watch an illegal copy of a movie (second questionnaire) and actual file-sharing behavior (binary variable, third questionnaire) as regressors and actual DVD rental or purchase

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[4]To provide empirical evidence for the absence of endogenous effects, we conduct the Durbin–Wu–Hausman augmented regression test for endogeneity (Davidson and MacKinnon 1993). Consistent with our theoretical argument, we find that the error term of the file-sharing regression is clearly nonsignificant in the theater visits regression equations, which implies that file sharing is indeed an exogenous variable as specified and that the results are unbiased by endogeneity. We conduct the same test for the DVD rental and DVD purchase equation and again find that file sharing is exogenous.

[5]Specifically, we calculate the change in channel revenues $\Delta Rev_{theaters}$ as $\Delta Rev_{theaters} = (\tau^{est}_{theaters} \times mov_{theaters} \times mc) - (\tau^{actual}_{theaters} \times mov_{theaters} \times mc)$, where $\tau^{actual}_{theaters}$ is the actual event probability of a consumer seeing a movie in a theater, $mov_{theaters}$ is the number of movies released in theaters in a specific year, mc is the number of movie consumers in a population, and $\tau^{est}_{theaters}$ is the event probability calculated by the ReLogit function for actual file-sharing behavior (=0). To apply monetary values to industry losses, we use the average 2005 ticket price in Germany.

[6]We use the same equation as in n. 5, with file-sharing intentions set to 1.

TABLE 2
ReLogit Results

A: Movie Theater ReLogit Model (n = 10,285)[a]					
	Overall Model[d]		**Watcher Model[e]**		**Nonwatcher Model[f]**	
	β (exp[β])	z-Value (p)	β (exp[β])	z-Value (p)	β (exp[β])	z-Value (p)
Intercept	−9.57	−27.47 (<.001)	−9.56	−27.46 (<.001)	−9.55	−27.43 (<.001)
File-sharing intentions	−.0926 (.912)	−3.52 (<.001)	−.0935 (.911)	−3.57 (<.001)	−.0997 (.905)	−3.81 (<.001)
File-sharing behavior	−.563 (.569)	−1.93 (.053)	−.815 (.443)	−2.09 (<.05)	−.0488 (.953)	−.11 (.911)
Screens (in 100)	.153 (1.165)	5.94 (<.001)	.152 (1.164)	5.90 (<.001)	.151 (1.163)	5.87 (<.001)
Attendance (in 1000)	.0001 (1.0001)	3.10 (<.01)	.0001 (1.0001)	3.14 (<.01)	.0001 (1.0001)	3.13 (<.01)
IMDb user rating	.347 (1.415)	7.95 (<.001)	.346 (1.413)	7.94 (<.001)	.346 (1.413)	7.94 (<.001)
Corrected theater intentions	.629 (1.88)	20.90 (<.001)	.629 (1.88)	20.90 (<.001)	.628 (1.87)	20.89 (<.001)
Corrected DVD rental intentions	N.I.		N.I.		N.I.	
Corrected DVD purchase intentions	N.I.		N.I.		N.I.	
Theater visit	N.I.		N.I.		N.I.	
Log-likelihood	4557.7		4556.2		4562.4	
χ² (d.f.)	1089.2 (6), p < .001		1090.7 (6), p < .001		1084.5 (6), p < .001	
McFadden R²	.193		.193		.192	
Nagelkerke R²	.238		.238		.237	

B: DVD Rental ReLogit Model (n = 7130)[b]					
	Overall Model[d]		**Watcher Model[e]**		**Nonwatcher Model[f]**	
	β (exp[β])	z-Value (p)	β (exp[β])	z-Value (p)	β (exp[β])	z-Value (p)
Intercept	−8.02	−14.40 (<.001)	−.801	−14.38 (<.001)	−8.02	−14.38 (<.001)
File-sharing intentions	−.122 (.885)	−2.91 (<.01)	−.127 (.881)	−3.05 (<.01)	−.118 (.889)	−2.83 (<.01)
File-sharing behavior	−.130 (.878)	−.36 (.720)	.465 (1.592)	1.11 (.268)	−.885 (.413)	−1.21 (.226)
Screens (in 100)	.073 (1.076)	1.06 (.290)	.073 (1.076)	1.06 (.291)	.070 (1.073)	1.02 (.309)
Attendance (in 1000)	.00003 (1.000)	.13 (.893)	.00003 (1.000)	.12 (.903)	.00004 (1.000)	.19 (.852)
IMDb user rating	.133 (1.142)	2.15 (<.05)	.132 (1.141)	2.14 (<.05)	.132 (1.141)	2.13 (<.05)
Corrected theater intentions	N.I.	N.I.	N.I.	N.I.	N.I.	N.I.
Corrected DVD rental intentions	.752 (2.121)	17.78 (<.001)	.752 (2.121)	17.78 (<.001)	.753 (2.123)	17.79 (<.001)
Corrected DVD purchase intentions	N.I.	N.I.	N.I.	N.I.	N.I.	N.I.
Theater visit	−.311 (.733)	−1.43 (.152)	−.298 (.742)	−1.38 (.169)	−.319 (.727)	−1.47 (.141)
Log-likelihood	2454.1		2453.5		2451.1	
χ² (d.f.)	387.3 (7), p < .001		397.9 (7), p < .001		400.3 (7), p < .001	
McFadden R²	.139		.140		.140	
Nagelkerke R²	.164		.165		.166	

TABLE 2
Continued

	C: DVD Purchase ReLogit Model (n = 7146)[c]					
	Overall Model[d]		**Watcher Model[e]**		**Nonwatcher Model[f]**	
	β (exp[β])	z-Value (*p*)	β (exp[β])	z-Value (*p*)	β (exp[β])	z-Value (*p*)
Intercept	−8.54	−7.82 (<.001)	−8.51	−7.80 (<.001)	−8.613	−7.88 (<.001)
File-sharing intentions	−.204 (.815)	−2.17 (<.05)	−.186 (.830)	−1.99 (<.05)	−.217 (.805)	−2.31 (<.05)
File-sharing behavior	1.15 (3.158)	2.42 (<.05)	.336 (1.399)	.43 (.667)	2.074 (7.957)	3.70 (<.001)
Screens (in 100)	.289 (1.335)	1.90 (.057)	.280 (1.323)	1.85 (.065)	.281 (1.324)	1.86 (.063)
Attendance (in 1000)	−.0009 (.999)	−1.79 (.074)	−.0009 (.999)	−1.71 (.087)	−.0009 (.999)	−1.72 (.086)
IMDb user rating	.078 (1.081)	.66 (.512)	.073 (1.076)	.62 (.536)	.082 (1.085)	.70 (.486)
Corrected theater intentions	N.I.	N.I.	N.I.	N.I.	N.I.	N.I.
Corrected DVD rental intentions	N.I.	N.I.	N.I.	N.I.	N.I.	N.I.
Corrected DVD purchase intentions	1.004 (2.729)	12.12 (<.001)	1.012 (2.751)	12.17 (<.001)	1.027 (2.793)	12.29 (<.001)
Theater visit	.095 (1.100)	.28 (.780)	.055 (1.057)	.16 (.871)	.050 (1.051)	.15 (.882)
Log-likelihood	652.5		656.7		648.5	
χ^2 (d.f.)	171.2 (7), *p* < .001		167.0 (7), *p* < .001		175.1 (7), *p* < .001	
McFadden R^2	.208		.203		.213	
Nagelkerke R^2	.217		.212		.222	

[a]Dependent variable is actual movie theater visits (0 = no, 1 = yes).
[b]Dependent variable is actual DVD rental behavior (0 = no, 1 = yes).
[c]Dependent variable is actual DVD purchase behavior (0 = no, 1 = yes).
[d]File-sharing behavior = 1 for all cases in which the respondent obtained a copy, regardless of watching.
[e]File-sharing behavior = 1 when copy is obtained and watched.
[f]File-sharing behavior = 1 when copy is obtained but not watched.
Notes: N.I. = variable not included in this model.

behavior as the binary dependent variable. Again, we exclude cases in which respondents had consumed a movie on DVD before they obtained the illegal copy to avoid a potential endogeneity bias. Again, we distinguish an overall model, a watcher model, and a nonwatcher model for both DVD channels.

In each model, we control for the impact of the respondents' intentions to rent a specific movie on DVD (in the model with DVD rental as the dependent variable) or to buy a specific movie on DVD (in the model with DVD purchase as the dependent variable). We correct these variables for the potential effect of file sharing with the same approach we used for theater visits. In addition, we control for the movie characteristics of screens, attendance, and user ratings, as well as for whether the respondents saw the movie in a theater (binary variable).

The ReLogit results for all DVD rentals and purchase models appear in Table 2. As with theater visits, all DVD models are highly significant. The explained variance is slightly lower for DVD rentals (Nagelkerke R^2 = .16/.17) than for DVD purchases (Nagelkerke R^2 = .21), consistent with the lower cognitive preparation usually associated with

rental decisions (Weinberg 2003).[7] For file-sharing intentions, we find significant, negative effects on both DVD rentals and purchases in all models, with βs between −.12 and −.13 for rentals (exp[β] approximately .89) and between −.19 and −.22 for purchases (exp[β] approximately .81).

The results are less straightforward for actual file-sharing behavior. Specifically, file-sharing behavior exerts no significant effect on DVD rentals in all three DVD rental models. However, we find a significant impact on DVD purchases in both the overall model and the nonwatcher model, though not in the watcher model. This significant impact is positive; greater file-sharing behavior increases the number of DVDs purchased. These findings suggest that when consumers gain access to a movie copy (with a control for file-sharing intentions) but do not watch it, their probability of purchasing the DVD is higher than it is for consumers who

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[7]Weinberg (2003, p. 24) reports that 50% of video renters in his sample "did not have a specific title in mind when they entered the store."

have not obtained an illegal copy. In such cases, the copy does not serve as a substitute for the DVD but rather stimulates consumers' desire to see the movie in a legal channel.

In summary, we find support for H_{1b} and H_{1c}, which state that file-sharing intentions diminish DVD rentals and purchases, but not for H_{2b} and H_{2c}, which posit a negative effect of obtaining illegal copies on the two DVD channels, or for H_{3b} or H_{3c}, which argue that the watching of copies cannibalizes DVD rentals and purchases. In the case of H_{2c}, we even find a significant, positive effect rather than the proposed negative effect. As an aside, the three movie characteristics play lesser roles for DVD consumption than in the theater channel. Although, in the DVD rental context, the user rating positively influences decisions to rent a specific movie on DVD, screens and theater attendance are not significant; for DVD purchase decisions, none of the movie characteristics are significant. A likely explanation is that after movies have appeared in theaters, extensive quality-related information becomes available, which is then incorporated into the consumers' intentions to rent or purchase the movie on DVD.

As in the case of theater visits, we use the ReLogit estimations to speculate about the strength of the industrywide effect of movie file sharing on DVD rentals and purchases.[8] In a fictitious constellation without any illegal movie copies (but file-sharing intentions remain unchanged), DVD rentals would increase by only .1% (from 103.4 million to 103.5 million transactions), producing approximately $.5 million of additional revenue. The positive effect of actual file sharing on DVD purchases means that purchases would be 2.9% lower in such an environment (from 40.1 million to 38.9 million), resulting in industry losses of $27.6 million. However, and more important, when file-sharing behavior and intentions do not exist or are minimal, DVD rental transactions grow by 10.5%, generating additional revenues of $36.9 million for the industry, and DVD purchase revenues would be boosted by $139.5 million, or 14.7%. Accordingly, these numbers indicate that the losses caused by movie file sharing are even greater for the home entertainment channels than for the movie theater channel. Altogether, our calculations suggest that the German movie industry loses $300 million per year as a result of consumer file sharing.

Testing File-Sharing Determinants

Data, Method, and Measures

In this section, we test the hypotheses that address the determinants of consumer file sharing (i.e., H_4–H_8) using data collected from our quota panel sample. Specifically, the second questionnaire contained several questions pertaining to the constructs that we propose influence consumer file sharing. In addition, we collect information about respondents' general file-sharing behavior (i.e., not limited to the 25 movies in our sample) by asking them to state the

absolute number of illegal movie copies they had obtained and watched during the preceding 12 months in both the first and the second questionnaires.

We apply PLS structural equation modeling (Fornell and Cha 1994) to test the hypotheses on file-sharing determinants. Specifically, we employ SmartPLS (Ringle, Wende, and Will 2005), which allows for the simultaneous testing of hypotheses while enabling single- and multi-item measurement and the use of both reflective and formative scales (Fornell and Bookstein 1982). The structural model shown in Figure 1 contains three latent variables for the different facets of the original movie's utility (gross utility, price, and transaction costs), four latent variables to address the different kinds of transaction costs associated with the copy (search, moral, legal, and technical costs), and one latent variable for each of the six specific utilities of the copy (transaction, mobility, storage, collecting, anti-industry, and social utility). The model also contains the degree of substitution and the consumer's file-sharing knowledge as determinants of watching and obtaining illegal copies and links from obtaining to watching illegal copies and from file-sharing knowledge to search costs.

We measure both obtaining and watching illegal copies with reflective three-item scales that combine respondents' actual file-sharing behavior with regard to the movies in our study with two further global measures. Specifically, we measured the obtainment of illegal movie copies as the number of copies of the movies surveyed that a respondent had actually obtained, the total number of illegal copies obtained within the year preceding the first questionnaire, and the answer to the same question from the second questionnaire. To measure the watching of illegal movie copies, we used the number of the movies surveyed that a respondent watched as illegal copies and the total number of illegal copies watched altogether within the 12 months preceding the first and the second questionnaires, respectively. To measure file-sharing determinants, we used existing scales when available and developed new scales for the rest, most of which took a formative nature. Except for the six specific utility variables, which we measured with one item each because of space restrictions, we used multiple items for all constructs (see Appendix B).

In general, the reliability of the reflective scales is satisfactory. Obtaining and watching illegal copies achieve alpha scores of .72 and .67, respectively, which is acceptable for a combination of surveyed and general prior behavior, as well as the lack of established scales in the researched domain (Peter 1979). For the other reflective scales, the alpha scores are greater than .70 in all cases. The average variance extracted is greater than .60 and composite reliability is greater than .75 for all constructs. Multicollinearity between the constructs is not an issue; all correlations among latent variables are less than or equal to .50. Table 3 lists the descriptive statistics and correlations.

Results

We list the path coefficients, t-values, and total effects in Table 4. The model explains 22.1% of the obtainment of and 79.6% of the watching of illegal movie copies. In each of the five general driver categories, at least one construct

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TABLE 3
Descriptive Statistics and Correlations

	M[a]	SD[a]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Obtainment of illegal movie copies	14.04	29.76	.72																
2. Substitute	11.40	3.85	.16	N.A.															
3. Gross utility (OR)	25.35	7.75	−.14	−.07	N.A.														
4. File-sharing knowledge	16.14	10.68	.31	−.00	−.15	N.A.													
5. Watching illegal movie copies	11.82	21.43	.89	.19	−.11	.29	.67												
6. Price (OR)	24.79	9.26	.09	−.10	.13	.09	.09	N.A.											
7. Transaction costs (OR)	18.78	11.49	.12	.07	−.01	−.04	.11	.08	N.A.										
8. Moral costs (CO)	11.18	3.76	−.12	−.05	.07	−.06	−.12	.05	−.01	.84									
9. Legal costs (CO)	7.56	2.49	.03	.06	−.02	−.01	.01	.06	−.00	.28	.71								
10. Technical costs (CO)	6.34	2.93	−.11	−.02	.11	−.25	−.14	−.03	−.02	.32	.34	.86							
11. Search costs (CO)	8.22	6.57	−.16	−.00	.16	−.24	−.15	−.04	.05	.22	.12	.33	N.A.						
12. Transaction utility (CO)	3.15	1.77	.17	.29	−.03	.13	.19	.05	.09	−.07	.02	−.01	−.05	N.A.					
13. Collection utility (CO)	1.53	1.00	.32	.25	−.06	.26	.29	.02	.05	−.05	.01	−.08	−.12	.22	N.A.				
14. Anti-industry utility (CO)	1.53	1.07	.22	.02	−.12	.30	.21	.06	.06	−.04	.02	.05	−.06	.21	.18	N.A.			
15. Storage utility (CO)	2.09	1.51	.24	.13	−.08	.33	.25	.04	.03	−.02	.10	−.06	−.09	.30	.34	.28	N.A.		
16. Social utility (CO)	1.41	.87	.24	.10	−.01	.25	.21	.01	.06	.04	.10	.10	.01	.29	.28	.42	.39	N.A.	
17. Mobility utility (CO)	2.65	1.81	.21	.14	−.07	.31	.23	.04	.01	−.01	.06	−.05	−.17	.29	.33	.26	.50	.30	N.A.

aMeans and standard deviations are calculated for the sum of construct items.
Notes: Numbers on the diagonal are Cronbach's alpha scores. N.A. = no alpha score calculated because the construct is measured by a formative scale or single item. CO = illegal movie copy, and OR = original movie.

TABLE 4
Impact of Determinants of File-Sharing Behavior

Effect of	On	Path Coefficient (t-Value)		Total Effect (t-Value)	
Utility of the Original					
Gross utility (OR)	Obtaining illegal movie copies	−.071	(1.84)*	−.071	(1.84)*
Price (OR)	Obtaining illegal movie copies	.075	(1.06)	.075	(1.06)
Transaction costs (OR)	Obtaining illegal movie copies	.100	(2.03)**	.100	(2.03)**
Gross utility (OR)	Watching illegal movie copies	.012	(.82)	−.050	(1.29)
Price (OR)	Watching illegal movie copies	.009	(.03)	.075	(1.02)
Transaction costs (OR)	Watching illegal movie copies	−.009	(.41)	.079	(1.68)*
Costs of the Illegal Copy					
Search costs (CO)	Obtaining illegal movie copies	−.063	(1.79)*	−.063	(1.79)*
Moral costs (CO)	Obtaining illegal movie copies	−.087	(2.62)**	−.087	(2.62)**
Legal costs (CO)	Obtaining illegal movie copies	.044	(1.00)	.044	(1.00)
Technical costs (CO)	Obtaining illegal movie copies	−.019	(.57)	−.019	(.57)
Search costs (CO)	Watching illegal movie copies	.015	(.82)	−.040	(1.15)
Moral costs (CO)	Watching illegal movie copies	.007	(.41)	−.069	(2.14)**
Legal costs (CO)	Watching illegal movie copies	−.016	(.80)	.022	(.50)
Technical costs (CO)	Watching illegal movie copies	−.040	(2.00)**	−.056	(1.78)*
Degree of Substitution					
Substitute	Obtaining illegal movie copies	.089	(2.66)**	.089	(2.66)**
Substitute	Watching illegal movie copies	.040	(2.16)**	.120	(4.01)**
Specific Utility of the Illegal Copy					
Transaction utility (CO)	Obtaining illegal movie copies	.012	(.34)	.012	(.34)
Collection utility (CO)	Obtaining illegal movie copies	.178	(2.90)**	.178	(2.90)**
Mobility utility (CO)	Obtaining illegal movie copies	−.002	(.04)	−.002	(.04)
Storage utility (CO)	Obtaining illegal movie copies	.035	(.78)	.035	(.78)
Anti-industry utility (CO)	Obtaining illegal movie copies	.064	(1.70)*	.064	(1.70)*
Social utility (CO)	Obtaining illegal movie copies	.085	(1.46)	.085	(1.46)
Transaction utility (CO)	Watching illegal movie copies	.019	(.93)	.030	(.80)
Collection utility (CO)	Watching illegal movie copies	−.018	(.69)	.138	(2.07)**
Mobility utility (CO)	Watching illegal movie copies	.036	(1.56)	.035	(.92)
Storage utility (CO)	Watching illegal movie copies	.029	(1.39)	.060	(1.32)
Anti-industry utility (CO)	Watching illegal movie copies	.010	(.52)	.066	(1.73)*
Social utility (CO)	Watching illegal movie copies	−.022	(.90)	.053	(.97)
File-Sharing Knowledge					
File-sharing knowledge	Obtaining illegal movie copies	.172	(4.83)**	.187	(5.28)**
File-sharing knowledge	Watching illegal movie copies	−.003	(.17)	.156	(4.60)**
File-sharing knowledge	Search costs (CO)	−.236	(2.12)**	−.236	(2.12)**
Additional Path					
Obtaining illegal movie copies	Watching illegal movie copies	.875	(26.27)**	.875	(26.27)**

*$p < .05$ (one-sided).
**$p < .01$ (one-sided).
Notes: OR = original commercial movie consumption, and CO = illegal movie copy. We calculated t-values through a bootstrapping routine with 813 cases and 500 samples.

has a significant, direct effect on obtainment ($p < .05$), in support of our hypotheses on file-sharing determinants. In addition, except for gross utility of the movie original (which is negatively correlated with obtainment, thus contradicting the prediction in H_{5a}), all significant parameters are in the proposed directions, providing general support for our hypotheses.

Of the 15 determinant constructs in the model, 8 have significant impacts. Specifically, as we propose in H_4, the degree of substitution between illegal copies and movie originals increases both obtainment and watching of illegal copies. Regarding the utility of the original, we find that the original's transaction costs raise the extent of obtainment,

as we propose in H_{5b}, in addition to the negative effect of the original's gross utility mentioned previously. The latter effect might result from the lower reference point for the utility of the original for consumers who possess more file-sharing knowledge. In other words, file-sharing skills might reduce the utility that consumers derive from seeing a movie in a commercial channel because they know how to get the same movie free of charge. In support of this argument, when we add a path from file-sharing knowledge to gross utility, the path from gross utility to file sharing becomes nonsignificant.

With regard to the transaction costs of the copy, three individual drivers are significantly correlated with file shar-

ing, in support of H_6. Whereas both search and moral costs provide hurdles for the consumer in obtaining illegal copies, technical costs directly reduce the probability that a customer will watch such copies. Two specific utilities of the copy enhance obtainment: perceptions of illegal movie copies as collectibles (the strongest direct effect of all determinants) and the consumer's anti-industry attitude, which makes file sharing a kind of revenge action. These findings support H_7. Consumers' file-sharing knowledge facilitates their obtainment of illegal copies directly, as well as by lowering search costs, as we propose in H_{8a} and H_{8b}.

As we expected, watching illegal movie copies correlates strongly with the extent of obtainment. Except for technical costs and degree of substitution, which also exhibit significant, direct paths to watching illegal movie copies, all determinant constructs in the model influence illegal watching not directly but only through obtainment, which serves as a full mediator.

Discussion, Implications, and Limitations

Massive speculation about the potential impact of consumer file sharing of motion pictures abounds in the movie industry. Although industry representatives claim that illegal movie copies cause revenue losses, no peer-reviewed study has yet tested these claims. Existing research findings from adjacent industries, such as the music industry, have been inconclusive, and all previous studies either lack empirical data or use questionable proxies for file sharing, such as consumers' Internet usage. Drawing on a longitudinal quota sample of German consumers, we use information about consumers' file-sharing intentions and behavior toward a set of actual movie titles and then test for the impact of movie file sharing on movie consumption in commercial channels. The controlled longitudinal design avoids biases from a priori differences between file sharers and non–file sharers. It also enables us to correct our measures of legal movie consumption intentions for potential biases caused by the availability of illegal movie copies, so that our estimates are unbiased by potentially unreliable "hindsight measures." In addition, this is the first study to test a theory-based model of file-sharing determinants in a motion picture context, and it significantly extends current knowledge about the drivers of consumer file sharing.

To determine the potential impact of file sharing on commercial channel consumption, we use ReLogit analysis, which corrects for logit coefficient bias, and find among our sample of 813 German consumers that illegal file sharing indeed affects movie theater box office revenues. Consumers' intentions to view an illegal copy of a new movie reduce their propensity to attend theaters. This finding suggests that file-sharing intentions (which imply the consumer's expectation of being able to obtain a copy of a certain movie for free) limit the consumer's interest in legal channel consumption, which in turn leads him or her to forgo consumption in these channels, regardless of whether the consumer actually obtains an illegal copy of the movie or not. We find that after we control for file-sharing intentions, obtaining an illegal movie copy significantly influ-

ences legal consumption only when the consumer has actually watched the copy. In addition, consumers' intentions to watch a movie copy significantly reduce their number of DVD rentals and purchases. Obtainment of illegal copies does not affect rental transactions and exerts a positive impact on DVD purchases when the consumer has not watched the copy. The latter effect suggests that an illegal movie copy can function as a cue for purchasing the DVD of a movie. In cases in which the copy the consumer obtains is broken or of a low quality, it can be argued that the consumer's positive anticipation of watching the movie is rerouted into a purchasing act. If the copy works, the mere presence and resulting salience of the copy seems to heighten the consumer's emotional and intellectual involvement with the movie title, which subsequently stimulates him or her to purchase the DVD of the movie (i.e., to "go for the original"). However, the positive impact of obtainment on DVD purchases is clearly less strong than the negative impact of file-sharing intentions. We calculate an overall annual industry loss of $300 million in Germany, which represents approximately 9.4% of the total industry revenues in 2005. Even when accounting for the assumptions of our method and sample, we consider these numbers substantial.

Three major implications arise from these results. First, the movie industry is correct in proclaiming that consumer file sharing destroys a significant amount of its revenues. Second, consumers' intentions to engage in file sharing cause them to forgo theater visits, legal DVD rentals, and legal DVD purchases. Therefore, decreasing consumers' intentions to watch illegal movie copies may be the most powerful way to fight movie piracy. A reduction in the number of illegal copies would have much less of an impact (or even no impact) on piracy, as long as intentions remain unaffected. Third, although our nationwide estimates represent bold numbers, they also demonstrate that recent industry claims exaggerate the true impact of file sharing. Some industry representatives argue that each illegal copy represents a lost theater visit (Valenti 2004)—an effect that is more than twice that of our ReLogit-based estimate. Similarly, the MPAA (2006) recently reported that industry losses due to piracy are $491 million in Germany per year, which exceeds our controlled longitudinal estimate by 73%.

We also can offer insight into the role of file sharing by comparing our loss estimates with the industry's overall economic development. Specifically, German movie theater revenues declined by 16.6% in 2005, which exceeds our 12.6% loss estimate for theater revenues and thus suggests that other factors contribute to the movie industry's crisis. This suggestion becomes even more persuasive when considering that movie file sharing grew by only 15.5% in 2005 (FFA 2006), so it logically should be responsible for only a small portion of the 2005 revenue decline. Assigning file sharing the role of the leading culprit might mean overlooking other threats of similar or even larger proportions. The declared "war on movie piracy" might limit the industry's ability to cope with and draw its attention away from societal developments, such as massive increases in consumer spending on video/computer games and cell phones. Consumers clearly have increased spending on home video

titles; DVD sales grew by double-digit figures to record numbers (Snider 2005), and a substitution effect is likely between theater visits and alternative kinds of movie consumption (Lehmann and Weinberg 2000). Therefore, movie studios might be contributing to shrinking attendance figures themselves by promoting other distribution channels, such as DVD sales and legal online services.

With regard to the determinants of illegal consumer file sharing, we adapt Rochelandet and Le Guel's (2005) utility theory approach and identify five categories of potential influencers. This approach clarifies file sharing and moves beyond the simplistic explanation of "because it's free" (e.g., MPAA 2004c). With our quota sample of 813 consumers, we test the impact of these drivers and their associated variables simultaneously through PLS. Our model explains more than twice the amount of variance of obtaining illegal copies than that achieved by previous studies (Rochelandet and Le Guel 2005). The PLS results highlight that each driver category contributes to consumer file sharing, though to differing extents. The three drivers that exert the strongest direct impact are the collection utility of the copy, consumers' file-sharing knowledge, and transaction costs of the original; we present the first two drivers for the first time here.

Our analysis also shows that file sharing occurs because of various factors, several of which offer antipiracy organizations specific starting points for countermeasures. Specifically, stressing the unethical element of appropriating copyrighted content without compensating the copyright owner in marketing campaigns could increase the moral costs of illegal file sharing and lower file-sharing activities. Similarly, because the transaction costs of commercial channels motivate consumer file sharing, movie producers should think about ways to reduce them. When watching a movie in theaters during its opening weekend is the only way to access a new movie legally, customers must pay the accompanying transaction costs that go far beyond the ticket price (e.g., babysitters and concession prices can make a single movie easily cost $50; Puig 2005) and therefore feel pushed toward illegal channels, such as file sharing. Making movies available through new channels, such as video-on-demand, that involve lower transaction costs for the consumers and shortening the time gap between the theater and the home entertainment channels might be an appropriate way to win back transaction cost–sensitive consumers. However, this strategy could cause other problems, such as increased interchannel cannibalization (Hennig-Thurau et al. 2007; Lehmann and Weinberg 2000). Another starting point for reducing file sharing would be to consider the degree of substitution the customer perceives. Although substitutability lies in the eye of the beholder, studios may want to stress the uniqueness of legal movie consumption or add features and elements to legal movie consumption that can hardly be included in illegal copies. Such elements might include events in the theater that stress the social element of moviegoing or attractive packaging of movies on DVD. The latter seems particularly relevant because it would reduce the relative collectability value of illegal copies, the main single driver of movie file sharing.

However, other measures will be less effective for reducing movie piracy, particularly if they focus on legal costs (i.e., the consumer's fear of legal persecution). Such actions appear to be largely ineffective for limiting file sharing; we find no significant impact of legal costs on obtaining illegal copies in our PLS analysis, despite the intimidation studios have attempted to exert on file sharers in recent campaigns. In other words, the movie industry's initial reaction to the threat of movie file sharing—suing its own customers—appears to be misguided.

As with every study, our results are limited to a certain extent. First, our analysis uses a set of 25 movies from 2006 to test the effects of file sharing on commercial consumption and investigate its drivers. Because this set represents a snapshot, it is unclear how the results might differ for different movies and a different time frame. However, our sample covers all major pictures released in the period, which gives us confidence that the results are stable. Second, in terms of generalization, our sample covers respondents from Germany, a major international market, but we can only speculate about other markets, such as North America. Because Germany and North America are similar in terms of several facets of movie consumption (e.g., U.S. films achieve a market share of 80% in Germany, movies' successes are highly correlated in the two countries, there are comparable Internet diffusion rates), we expect the findings to be similar for North America, but we cannot provide empirical evidence to substantiate this. Similarly, although we provide strong evidence of cannibalization resulting from illegal copies and though the similarities between movies and other entertainment products suggest that the same effects could take place in those industries, our study cannot ensure cross-industry generalizations. Third, although our sample systematically mirrors the German movie consumer population in demographics, we concede that it is not a true random sample. However, post hoc comparisons show that other criteria, such as movie consumption patterns, are similar between the sample and the relevant population. Fourth, our measurement approach enables us to separate the effects of consumer file-sharing intentions and behaviors on movie consumption on the basis of a controlled longitudinal study, but the survey method means that we must rely on consumer self-reported data rather than on "objective" data. However, we believe that this limitation does not strongly affect the results, because we use actual movie titles, measure specific behavioral variables, and avoid any kind of moral bias in the questionnaires. Fifth, we acknowledge that the consumer $\times$ movie observations in our data are not completely independent, which reflects reality, because some consumers will watch several movies in a given period and other consumers will watch only one. Sixth, we needed to develop several scales ourselves because of the limited extant research on movie file sharing. Although these scales indicate solid reliability and validity, further research into their quality would be helpful. This recommendation is particularly applicable to the determinant variables we measure using single items.

APPENDIX A
List of Movie Titles

Title	Description	Individual Responses for Theater[a]	Individual Responses for DVD[c]
Bambi 2	United States 2006, family	111 (4)	110 (6, 4)
Basic Instinct 2	United States 2006, thriller/drama	561 (23)	497 (14, 7)
Brokeback Mountain	United States 2005, drama/romance	374 (81)	324 (18, 5)
Capote	United States 2005, drama	375 (25)	324 (13, 2)
Casanova	United States 2005, comedy/romance	705 (33)	630 (31, 9)
Da Vinci Code	United States 2006, thriller	559 (175)	—[d]
Die Wilden Hühner	Germany 2006, family	112 (7)	110 (3, 4)
Die wilden Kerle 3	Germany 2006, family	112 (7)	110 (5, 3)
Die Wolke	Germany 2006, drama/romance	372 (7)	—[d]
Elementarteilchen	Germany 2006, drama/romance	375 (51)	324 (14, 0)
Failure to Launch	United States 2006, comedy/romance	702 (49)	630 (42, 6)
Felix 2	Germany 2006, family	112 (4)	—[d]
Freedomland	United States 2006, thriller	563 (0)[b]	—[d]
Good Night, and Good Luck	United States 2006, thriller/drama	559 (16)	—[d]
Ice Age 2	United States 2006, family/comedy	112 (53)	—[d]
Lord of War	United States 2005, action/thriller	451 (45)	394 (54, 5)
Mission: Impossible III	United States 2006, action/thriller	449 (66)	—[d]
Pink Panther	United States 2006, comedy	702 (25)	630 (22, 3)
Saw II	United States 2006, action/horror	451 (26)	394 (23, 1)
Scary Movie 4	United States 2006, comedy/horror	698 (22)	630 (21, 4)
Syriana	United States 2006, thriller/drama	563 (53)	497 (53, 9)
The New World	United States 2005, drama/adventure	373 (2)	324 (8, 1)
The Weatherman	United States 2005, comedy/drama	703 (13)	630 (23, 6)
Underworld 2: Evolution	United States 2006, action/fantasy	451 (45)	394 (25, 11)
V for Vendetta	United States 2005, action/science fiction	450 (34)	394 (17, 9)

[a]Number in parentheses signifies positive theatergoing decisions.
[b]German movie theater release canceled after disappointing U.S. box office results.
[c]Number in parentheses signifies positive DVD rental and DVD purchase decisions.
[d]Movie not released on DVD at the time of the third survey.

APPENDIX B
Items for File-Sharing Determinants

Construct	Measurement	Scale; Adapted from
Gross utility of the original movie	1. What are you usually willing to pay *when watching a new movie at the theater*? 2. What are you usually willing to pay *when purchasing a new movie on DVD*? 3. What are you usually willing to pay *when renting a new movie on DVD*?	Formative, metric; Rochelandet and Le Guel (2005)
Price of the original movie	1. When you go to the movies: In your experience, what do you pay for a theater ticket? 2. When you purchase a movie on DVD: In your experience, what do you pay for a DVD? 3. When you rent a movie on DVD: In your experience, what do you pay for renting a movie?	Formative, metric; Rochelandet and Le Guel (2005)
Transaction costs of the original movie	1. How cumbersome is it to watch a chosen movie in a movie theater? 2. How cumbersome is it to purchase a chosen movie on DVD? 3. How cumbersome is it to rent a chosen movie on DVD? 4. In your experience, how high are the additional costs (beyond the price of the theater ticket) when going to the movies? 5. In your experience how high are the additional costs (beyond the price of the DVD) when purchasing a movie on DVD? 6. In your experience how high are the additional costs (beyond the rental price) when renting a movie on DVD?	Formative, six-point; Rochelandet and Le Guel (2005)
Moral costs of the copy	1. Sharing movie copies with others via Internet file-sharing networks is unfair to the filmmakers. 2. Sharing movie copies is unethical. 3. When you share movie copies, you do harm to someone.	Reflective, six-point; Huang (2005)

Construct	Measurement	Scale; Adapted from
Legal costs of the copy	1. The danger of being punished for sharing movie copies is high. 2. Sharing movie copies is a legally risky thing.	Reflective, six-point; Chiang and Assane (2002)
Technical costs of the copy	1. The danger of my personal computer becoming infected with computer viruses when sharing movie copies is high. 2. Sharing movie copies can entail serious technical computer problems.	Reflective, six-point
Search costs of the copy	1. How cumbersome is it to download a chosen movie from file-sharing networks? 2. How cumbersome is it to get a chosen movie as a copy from others?	Formative, six-point; Rochelandet and Le Guel (2005)
Degree of substitution	1. To what degree can a movie copy downloaded from file-sharing networks or received from friends substitute viewing the movie in a theater? 2. To what degree can a movie copy downloaded from file-sharing networks or received from friends substitute purchasing the movie on DVD? 3. To what degree can a movie copy downloaded from file-sharing networks or received from friends substitute renting the movie on DVD?	Formative, six-point; Rochelandet and Le Guel (2005)
Transaction utility	With movie copies you can make a real "deal"!	Single-item, six-point; new scale
Mobility utility	You can take movie copies with you on the go (e.g., on notebook computers or video iPods).	Single-item, six-point; new scale
Storage utility	With movie copies, you can save space in your flat compared to DVD video boxes.	Single-item, six-point; new scale
Anti-industry utility	By obtaining movie copies, you can "get back" at the movie studios and media corporations.	Single-item, six-point; new scale
Social utility	By sharing movie copies, you belong to a group of like-minded people with similar interests.	Single-item, six-point; new scale
Collection utility	Movie copies have a high collector's value.	Single-item, six-point; new scale
File-sharing knowledge	1. I know several different file-sharing networks. 2. I know how to find and download software for file-sharing networks on the Internet. 3. I know how to set up file-sharing software in order to download files from these networks. 4. I know how to configure firewalls in order to be able to access file-sharing networks. 5. I know how to find and download codecs from the Internet. 6. I can judge from the video file format (e.g., avi, xvid-avi, divx-avi, wmv, mpeg) and the file size just about how good the image quality of the downloaded video file will be.	Formative, six-point; new scale

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