Pirates or Explorers?

Analysis of Music Consumption in French Graduate Schools

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Abstract

This paper analyzes the impact of music file sharing on CD purchases. Traditionally, two arguments are opposed concerning the impact of the music file sharing on CD sales. On the one hand, MP3s downloads only reduces sales of legitimate. On the other hand, consumption of free MP3s could lead people to buy CD which they would never have bought otherwise (the "sampling effect"). Because the court in the Napster case and some academic researchers have dismissed this sampling effect, this article seeks to assess whether sampling does indeed occur and in the affirmative what are the relative contributions of the positive sampling and the negative competition effects of MP3 files on CD purchases. To do so, we administered an anonymous online survey in two French graduate schools from May 26 to June 3, 2004. Using answers to the questions, we analyze the factors that influence the probability to increase CD purchases after acquiring MP3 files and those that influence the probability to decrease CD consumption. First, our estimation results suggest that there exist two populations of music consumers: people who sample a lot (*the explorers*) and those who do not sample (*the pirates*). We show that MP3s consumption leads to an amplification of consumption patterns: music fans use MP3 files to discover new genres, artists and albums, which tends to increase their purchases of CDs, while students with little interest in music use Mp3 files as direct substitute to CDs. Secondly, we provide evidence that the channel of MP3 acquisition also matters: communities formed around an intranet positively impact CD consumption.

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1. Introduction

Lawsuits against music uploaders on file-sharing or Peer-to-Peer (P2P) networks have made headline news. These lawsuits are motivated by the perception that music shared on P2P networks substantially harms record companies and even threatens the existence of the music industry. The vision of the record companies that digital copies available on P2P networks only displace sales of legitimate CDs has also led the industry to increase technological protection, such as new Digital Rights Management protection, and lobbied for increased copyright protection. This argument is related to the "competition effect" according to which digital copies that offer a similar quality at zero cost directly and unfairly compete with original CDs.

While there has been some evidence that music downloads have decreased music sales in the early days of MP3 downloads first from Napster and then from Kazaa, this vision is shortsighted. First, other factors have played an important role in the downturns in CD sales during the period 2000-2003 (see Peitz and Waelbroeck, 2004; PW hereafter). Secondly, although MP3 could be downloaded quite fast with the first two generations of P2P networks (Napster and Kazaa), MP3 files take substantially more time to download from recent file-sharing networks such as eMule, bitTorent and the such. Indeed, priority rules limit the speed at which a file can be downloaded by an internet user as a function of the number and size of files that he shares/uploads. So, there is at least an opportunity cost of downloading music files. Third, CDs and MP3 files do not offer the same value to music fans who appreciate uncompressed sound and booklets with lyrics and pictures. Finally and most importantly, digital copies can provide information on the value of an album. This is an important feature of music for which consumers have different tastes and for which there is uncertainty on the genres, style and quality of new releases that represent more than half of yearly sales. This so-

called “sampling” or “matching” property of digital copies can potentially lead an internet user to purchase a CD that he or she would never have purchased without this information.

Because the court in the Napster case and some academic researchers have dismissed this sampling effect, this article seeks to assess whether sampling does indeed occur and in the affirmative what are the relative contributions of the positive sampling and the negative competition effects of MP3 files on CD purchases. For this purpose, we analyze the factors that influence the probability that an internet user increases or decreases her CD purchases after obtaining MP3 files.

To answer these questions we need data at the individual level since aggregated data are subject to much more criticisms, as argued by Liebowitz (2004). College students are a good group to focus on for several reasons. First, college students are technophiles who are more likely to possess a broadband connection and to have downloaded and shared files on the Internet (see surveys documented in PW). Secondly, college student have a strong taste for music and frequently go to live concerts. Finally, college students have an important discretionary income that they spend on entertainment goods, including music.

We administered surveys in two French "Grandes Ecoles" (graduate schools).

Using answers to the questions asked in the surveys, we analyze the factors that influence the probability to increase CD purchases after acquiring MP3 files and those that influence the probability to decrease CD consumption. We highlight two main points. First, our estimation results suggest that there exist two populations of music consumers: people who sample a lot (*the explorers*) and those who do not sample (*the pirates*). We show that MP3s consumption leads to an amplification of consumption patterns: music fans use MP3 files to discover new genres, artists and albums, which tends to increase their purchases of

CDs, while graduate school members with little interest in music use MP3 files as direct substitute to CDs. Secondly, we provide evidence that the channel of MP3 acquisition also matters: communities formed around an intranet have a positive effect on CD consumption.

There are several good surveys of the empirical studies that analyze the effect of internet piracy on music sales (see for instance PW or Liebowitz, 2004). Most of these studies use aggregate data and proxy variables for internet piracy or music downloads that make results difficult to interpret. The two closest articles to our research are Zentner (2004) and Rob and Waldfogel (2004). Zentner (2004) uses individual survey data from October 2001 in large European countries. After controlling for unobserved heterogeneity in music taste, Zentner finds that music downloads reduce the probability to purchase music by 30%. Assuming that people who download music purchase as much as people who do not, Zentner finds that internet piracy could have decreased CD sales in unit by 7% in the countries considered. Rob and Waldfogel (2004) use a survey of college students to determine which albums have been downloaded most. Using a list of hit albums and a list of albums acquired by the respondents during the past year, they explain variation in individual CD consumption by the number of albums downloaded from the corresponding list. They find a statistically negative effect of downloaded albums on purchased albums. Next they use answers to valuation questions to determine if students download high- or low-value albums. Data suggest that depreciation and the nature of music as an experience good can explain the difference and the correlation between ex-ante and ex-post valuations and that students download low-valuation albums.

Our research contributes to the existing literature on several points. First, Zentner (2004) and Rob and Waldfogel (2004) only explain the effect of illegal music downloads on the *level* of

CD consumption of a student or individual. This approach can only identify the aggregate effect of MP3 files but can not assess the relative contribution of the sampling effect. We have information on the *change* in CD purchases induced by MP3 acquisition at the individual level, which is what we are really interested in.). In addition we have several variables that characterize sampling, taste for music and the channels of MP3 acquisitions, including file-sharing on the internet but also file exchanged over intranets as well as direct physical exchange through USB keys and CD-Rs. These channels will turn out to be important in the econometric analysis. Secondly, our survey provides direct evidence on the number of files downloaded rather than indicator of downloading (Zentner, 2004) or the number of albums downloaded (RW, 2004). Thirdly, we have a direct measure of the extent of sampling among our respondents that we use to interpret our results. Finally, our study asks question about the overall change in CD consumption due to MP3 files and is less subject to the time the survey was made. Indeed, Zentner uses data from October 2002, which corresponds to a period with shifts in demand patterns (back to school offers) and only concern CD purchases during September 2002. Similarly, the study of RW was carried out during the semester following the first lawsuits against music uploaders on P2P networks.

The paper is organized as follows. First, we describe the dataset and we assess the importance of sampling activities among survey respondents. Next, we determine the effect of MP3 consumption on CD purchases and discuss the implications on aggregate CD sales. Some conclusions follow.

2. Data

In this section, we describe the dataset. We administered an anonymous online survey in two French graduate schools from May 26 to June 3, 2004. A web site was set up to host the survey, which we directly coded in HTML. We then requested by mailing lists all undergraduate and graduate students as well as all administrative staff and professors to fill in the online survey. The questionnaire included thirty six closed questions divided in six main parts: information on the respondent (school, sex and age), Internet access, music consumption, MP3 exchanges, MP3 uses and opinion on downloading. At the end of the questionnaire, the respondent was asked to submit the form (by pressing a button). In doing so, a script automatically gathered the answers and sent them to us by email.[2] Overall, 589 people answered the questionnaire, i.e. a 30% response rate. Only 352 students answered the most relevant questions and this is the sample that we use in the econometric analysis and that we comment on in this section.

2.1. Demographics

The respondents are mainly male (89%) and students (90%). 85% are enrolled in an undergraduate or graduate program and 5% in a PhD program. The faculty and administrative staff account for 4% and 5% of the sample, respectively.

Almost all the respondents have Internet access at home and most of them (93%) have a broadband connection. 90% of the respondents spend at least 5 hour per day online and 30% spend more than 30 hours per day.

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[2] We used the PHP language. PHP (acronym for Hypertext Preprocessor) is an open source scripting language used to create dynamic Web pages. The use of PHP scripts in our online survey allowed us to collect automatically the respondent's answers without manually copying them (which guaranties their integrity).

2.2. Taste for music

The respondents have a strong taste for music as more than 82% listen to music at least once a week, and 53% of the respondents listen to more than 10 hours per week. Moreover, among the music-related activities that the respondents did on a regular basis, 44% visited a record store to get information or to buy music, 36% went to live concerts and 33% play an instrument.

As expected, people in the survey purchase more CDs than average. More than 35% of the respondents purchase 5 CDs or more each year, with an average of about 5.5 per year. This contrasts with the average CD consumption of 2.6 per capita in France among adults of 20 or more.[3] However, 16% of the respondents claimed they did not purchase any CD. Large volumes of annual CD purchases translate into large collections of music CDs. The average number of CDs owned is around 80. 31% of respondents owned more than 100 CDs.

2.3. Consumption of MP3

In this study, we are interested in the effect of total MP3 consumption on music CD sales. This includes MP3 files downloaded from the Internet, from Internal networks, or physically exchanged, such as MP3 obtained from friends or family members.

88% of respondents obtained free MP3 files by any of these means. Among these, 70% downloaded files from P2P networks, 74% download files from Internal networks, and 58% got files by physical exchanges (CD-R, USB memory keys, etc.). Fewer persons share MP3 files by any of these means (57%). Among people who share files, the preferred means is

[3] According to IFPI, 118 million CDs were sold in France in 2003, and there were 45 million adults of 20 or more according to INSEE (75% of the French population).

Intranet (69%), followed by physical exchange (56%) and P2P (48%). The observed difference in "download" and "upload" channels has two implications. First, it suggests the existence of virtual communities, the members of which share music files through more personal relationships (physical exchange and Internal network) as opposed to anonymous file sharing on P2P networks. Second, our data set indicate that, even if P2P networks were shot down, music file sharing would still prevail, as there are other means of sharing music files.

Approximately, half of respondents obtained pop-rock music files. Interestingly, around 8% of respondents got music from French artists, whereas according to the French recording association (SNEP), French songs represented more than 40% of total CD sales in France in 2003.

Finally, more than half of the respondents reported that they had more than 500 MP3 files. Less than 10% of the respondents declared that they did have any. Approximately 73% of those who have MP3 files on their computer preserve more than half of the files. This variable enables us to discriminate between "pirates" and "explorers". Indeed, consider first a "pirate", that is, a user whose main motivation for getting MP3 files is to constitute a digital music library at no cost. Then, obviously, this user will keep most of his MP3 files. On the other hand, consider an "explorer", who uses MP3 files so as to discover new artists or new music. After listening to MP3 files, this user has incentives to delete (at least) the files he has not interested in, in order to save space and time organizing files.

Table 1. Summary statistics

Variables	Mean
Sexe	
Male	0.8892
Female	0.1108
Status	
Student	0.8523
PhD	0.0511
Professor	0.0426
Administrative staff	0.0540
Broadband connection (cabel, ADSL, T3)	
Yes	0.9290
No	0.0710
Time spent on the internet	
5 or less	0.0994
6-15	0.3409
16-29	0.2500
30 or more	0.3097
Time spent listening to music	
5 or less	0.1818
5-10	0.2869
10 or more	0.5313
Go to record store	0.4403
Read music magazine	0.1080
Go to live concert	0.3636
Play music instrument	0.3551
CD purchase	
Never	0.1619
1-4	0.4858
5-10	0.2045
10 or more	0.1477
How do you obtain MP3 files?	
Peer-to-Peer	0.7045
Intranet	0.7386
Digital media support (CDR, USB Key)	0.5795
Music genre	
Hard/Metal/Punk	0.0795
Jazz/Blues/Classical	0.0795
World music	0.0398
Pop/Rock	0.4602
Rap	0.0426
Techno/dance	0.0568
French artists	0.0824
International artists	0.1591
Number of MP3 files	
Less than 29	0.0653
30-100	0.0852
101-200	0.1136
201-500	0.1193
More than 500	0.6165
Keep less than half MP3s	0.2670
Keep more than half MP3s	0.7330

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Sampling

In this section, we determine if there exists any positive aspects of music downloads. In particular, we assess the importance of sampling activities among survey respondents. We find that the large majority of MP3 users sample new music that they eventually purchase. Indeed, 93% of those who obtained free MP3s claimed that they have discovered new artists through listening to MP3s, and 70% reported that listening to digital music led them to purchase CDs that they would not have purchased otherwise. This results illustrates a strong "sampling effect" among the respondents of the survey.

When asked what impact free downloading of MP3 files has had on their CD purchases, 49.1% say free downloading has not influenced CDs purchases, 30.4% say it has decreased CDs purchases and 20.5% say it has increased (Tables 2). These percentages are comparable to those reported in other surveys based on representative samples documented by the IFPI (2004). This suggests that even though we work with a specific population there is no strong difference with the aggregate population and that respondents were on average sincere. Obviously, people who do not use MP3 files to sample new music in order to make more informed purchased have a low likelihood to have increased CD purchases after acquiring MP3 (0 in our sample). Interestingly, there are slightly more "samplers" (or "explorers") who have increased (72) rather than decreased (55) music consumption after listening to MP3 files.

Table 2. What is the global effect of MP3 files on CD purchased?

Did consuming MP3 files lead you to purchase a CD that you would not have bought otherwise?	Decreased	Stayed the same	Increased	Total
No	52	55	0	107
Yes	55	118	72	245
Total	107	173	72	352

Tables 3 to 4 indicate that people who sample music in order to purchase new music both download a lot and purchase a lot. On the hand, there are much more pirates who do not purchase any CD anymore than pirates who purchase more than 10 CD on verage per year (43 vs. 3). This pattern is inversed for the "explorers": 14 do not purchase CDs anymore vs. 49

who consume more than 10 CDs on average per year.[4] On the other hand, the "explorers" proportionally download more than twice as many files as the "pirates" (Table 4).

Table 3. How many CDs do you purchase per year?

Did consuming MP3 files lead you to purchase a CD that you would not have bought otherwise?	0	1-4	5-10	More than 10	Total
No	43	50	11	3	107
Yes	14	121	61	49	245
Total	57	171	72	52	352

Table 4. How many MP3 files do you have?

Did consuming MP3 files led you to purchase a CD that you would not have bought otherwise?	Less than 29	30-100	100-199	200-499	500+	Total
No	9	8	12	13	65	107
Yes	14	22	28	29	152	245
Total	23	30	40	42	217	352

3. Effect of MP3 consumption on CD purchases

We determine the net contribution of MP3 consumption on CD purchases by estimating a multinomial logit model. There are three possible outcomes: MP3 consumption did not influence CD purchase, MP3s globally led to a decrease in CD purchases or to an increase in CD purchases. Tables 5 and 6 report the estimation results (the base category is no effect).[5]

Table 5. Probability to decrease CD purchase

Variable	Coef.	Std. err.	p-value

[4] The fact that 14 persons claimed to have used MP3 files to make more informed music purchase might be puzzling. There are two explanations. First, they might purchase a very small number of albums per year so that 0 is a closer approximation than 1-4. Secondly, thye might purchase CDs to offer to friends as gifts.

[5] We also ran two independent probit estimation procedures to determine the factors that influence the probability to increase and to decrease purchases using respondents who claimed that MP3s did not influence their CD consumption as the base category. Results were qualitatively identical to those reported in Tables 5 and 6.

Status			
Student			
PhD	-0.9060	0.8533	0.2880
Professor	-0.5179	0.9234	0.5750
Administrative staff	0.2787	0.8202	0.7340
Sexe			
Female			
Male	0.4194	0.5022	0.4040
Internet connection			
Cable/ADSL/T1	-0.0210	0.6319	0.9740
Time spent on the internet			
5 or less			
6-15	0.2397	0.5257	0.6480
16-29	-0.1511	0.5493	0.7830
30 or more	0.4041	0.5424	0.4560
Time spent listening to music			
Less than 5			
5-10	0.3729	0.4294	0.3850
10 or more	0.2060	0.4256	0.6280
Go to record store	-0.7337**	0.3453	0.0340
Read music magazine	0.6374	0.5667	0.2610
Go to live concert	-0.2256	0.3460	0.5140
Play music instrument	0.5235	0.3213	0.1030
Music genre			
Hard/Metal/Punk	0.2675	0.5404	0.6210
Jazz/Blues/Classical	0.4667	0.5902	0.4290
World music	-1.0899	0.9021	0.2270
Pop/Rock			
Rap	1.6406**	0.7033	0.0200
Techno/dance	-0.8824	0.6471	0.1730
French artists	-0.1944	0.5258	0.7120
International artists	-0.5965	0.4465	0.1820
CD purchase			
Never			
1-4	0.1700	0.3924	0.6650
5-10	-0.4880	0.5253	0.3530
10 or more	-0.6319	0.7027	0.3690
How do you obtain MP3 files?			
Peer-to-Peer	0.3473	0.3175	0.2740
Intranet	0.5837	0.3800	0.1250
Digital media support (CDR, USB Key)	-0.1118	0.2947	0.7040
Number of MP3 files			
Less than 29			
30-100	0.9010	1.0292	0.3810
101-200	1.7765*	0.9390	0.0590
201-500	0.6313	0.9554	0.5090
More than 500	1.4178	0.9060	0.1180
Do you keep MP3 files?			
Less than half			
More than half	0.7132**	0.3653	0.0510
Constant	-3.4183***	1.2539	0.0060

obs.: 352

Taste for music. The variables related to taste for music do not seem globally to be relevant. However, people who go to record stores have a lower probability to have decreased CD purchases. On the contrary, university members who download rap music have a significantly higher probability to have reduced CD consumption compared to those who download pop/rock music. This could be due to lower difference in quality between the original CD sound and the MP3 files or to the way this music is consumed (in the street with a portable MP3 players, in groups, in parties, ...), which reduces the willingness to pay for this type of music and makes rap fans less likely to purchase a CD after listening to it on MP3 format.

Channels of MP3 acquisition. The means of MP3 acquisition does not seem to be a relevant factor explaining a decrease in CD consumption. All three channels of MP3 acquisition are equally used to obtain songs illegally.

Number of MP3 files. Overall the number of MP3 files does not decrease the probability to purchase less CDs after obtaining MP3 files, except for people acquiring an "average" number of files (i.e. between 100 and 200). The latter are either people starting to download files or having little interest in (digital) music. The former interpretation according to which new broadband users tend to decrease purchases more than older internet users is compatible with other studies that find that the effect of MP3 files on CD sales is negative for young internet users while it is insignificant or positive for older internet users (see Boorstin, 2004 and surveys reported in PW, 2004 for instance).

Pirates or explorers. People who keep more than half of the MP3 files that they downloaded or obtained from friends have a significantly higher probability to have reduced CD consumption than those who do not. In other words, people who build a digital music collection and whom we assimilated with the pirates of the digital waves are more likely to have reduced their CD purchase than the “explorers”.

Table 6. Probability to increase CD purchase

Variable	Coef.	Std. err.	p-value
Status			
Student			
PhD	-0.1184	0.7749	0.8790
Professor	0.0156	0.8494	0.9850
Administrative staff	0.7063	0.8609	0.4120

Sexe			
Female			
Male	-0.3555	0.6010	0.5540
Internet connection			
Cable/ADSL/T1	-0.3670	0.5980	0.5390
Time spent on the internet			
5 or less			
6-15	0.8615	0.6670	0.1970
16-29	0.7388	0.6907	0.2850
30 or more	1.2689*	0.6791	0.0620
Time spent listening to music			
Less than 5			
5-10	0.6787	0.5635	0.2280
10 or more	0.6829	0.5379	0.2040
Go to record store	-0.0298	0.3817	0.9380
Read music magazine	0.5094	0.5582	0.3610
Go to live concert	-0.1150	0.3717	0.7570
Play music instrument	0.1695	0.3639	0.6410
MP3 genre			
Hard/Metal/Punk	-0.2692	0.6483	0.6780
Jazz/Blues/Classical	0.8881	0.6007	0.1390
World music	-0.0099	0.8338	0.9910
Pop/Rock/Reggae			
Rap	0.5120	1.2507	0.6820
Techno/dance	-1.1587	0.7669	0.1310
French artists	-0.2875	0.6349	0.6510
International artists	0.5939	0.4921	0.2270
CD purchase			
Never			
1-4	1.7399**	0.7378	0.0180
5-10	2.3719**	0.7899	0.0030
10 or more	2.8754***	0.8877	0.0010
How do you obtain MP3 files?			
Peer-to-Peer	0.2480	0.3695	0.5020
Intranet	1.0099**	0.4620	0.0290
Digital media support (CDR, USB Key)	-0.5126	0.3493	0.1420
Number of MP3 files			
None			
1-29			
30-100	0.7958	0.8290	0.3370
101-200	-0.8038	0.9280	0.3860
201-500	-1.5941	1.0652	0.1350
More than 500	0.7417	0.7685	0.3340
Do you keep MP3 files?			
Less than half			
More than half	-0.9157**	0.3678	0.0130
Constant	-4.2224***	1.4046	0.0030

obs.: 352

Taste for music. People with a strong taste for music have a higher probability to increase CD purchases after obtaining free MP3 files. All the variables associated with the number of CD purchased per year have positive significant signs.

Channels of MP3 acquisition. People who share files using an internal network have a higher probability to increase CD purchases. These music fans form virtual communities from which they can quickly and efficiently obtain information on the music they will most likely enjoy. This type of information is most relevant for sampling, contrary to files downloaded from the internet where there are no cross-recommendations and no possibilities to share playlists.

Number of MP3 files. MP3 files do not significantly increase the probability to purchase more CD after obtaining MP3 files. As we have discussed in section 2, there are many pirates who download a lot of MP3 files but there are also many explorers who have listened to more than 500 MP3 files. Thus the number of MP3 files alone can not discriminate between the two populations.

Pirates or explorers. People who keep less than half of the MP3s that they acquired have a significantly higher probability to have increased CD purchases. These are the explorers who sample new music in order to make informed purchases.

4. Discussion

Although the survey was not designed to measure the overall quantitative effect of MP3 files on CD sales, we can tabulate answers to the effect of MP3s on CD purchases of a respondent with respect to his answers to the number of CDs he purchases on average per year. This is done in Table 7 using the full sample.

Table 7. Impact of MP3 on CD sales

	None	1 – 4	5 – 10	10 or more	Total
Increased	4	32	26	36	98
Decreased	29	88	20	8	145

We can use these numbers to create different scenarios about the effect of MP3 files on CD sales among survey respondents. Table 8 was constructed by taking the mean of each CD purchase category and by assuming that respondents increased or decreased CD purchases by 10%, 20%, 30%, 40% and 50%. Assuming that respondents who increased their music purchase by the same percentage as those who decreased CD consumption would lead to an overall positive effect of MP3 files on CD sales (numbers in the main diagonal of Table 8). Overall CD sales start to decline when the "pirates" decrease their purchases by 50% more than the "explorers" in percentage. Measuring accurately the substitution and the complementarity between MP3 files and CDs is an interesting topic for further research.

Table 8. Simulating the effect of MP3 on CD purchases

	Explorers	Increase by				
Pirates		10%	20%	30%	40%	50%
Decrease by	10%	2,18%	8,26%	14,35%	20,44%	26,53%
	20%	-1,74%	4,35%	10,44%	16,53%	22,63%
	30%	-5,65%	0,44%	6,53%	12,62%	18,70%
	40%	-9,56%	-3,47%	2,62%	8,70%	14,79%
	50%	-13,47%	-7,38%	-1,30%	4,79%	10,88%

5. Conclusion

The main contribution of this article is to show that there are two populations of MP3 users: people who use new-sharing technologies to sample and discover new music, which leads them to purchase more CDs (the explorers) and people who mainly use MP3 files as substitutes to regular CDs (the pirates). Thus new file-sharing technologies have amplified consumption patterns in the sense that music fans have increased their legal consumption of music while people with low interest in music have reduced their CD consumption.

This important result leads to several implications. First, New business models should try and better discriminate between these two types of users of digital music in order to extract more surplus from the true music fans. New online music services allow internet users to download as many music files as they want for a monthly fee (Napster 3.0) or to listen to DRM-

protected files for several times before the protection is triggered (Altnet matches file-sharing users to new artists through such a system). Second, it is equally important to let music fans form online communities as we have found that people who share music on internal networks associated with small virtual communities have a higher probability to increase CD consumption. Online communities on intranets also imply that shutting down anonymous P2P networks on the internet would not completely eliminate unauthorized exchanges of copyrighted music files.

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