

P2P MUSIC SHARING NETWORKS: WHY THE LEGAL FIGHT AGAINST COPIERS MAY BE INEFFICIENT

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ABSTRACT. The paper investigates empirically the behavior of copiers over P2P networks based on an ordered Logit model of intensity using a dataset collected from more than 2,500 French households. In accordance with the prediction of the Beckerian framework, copying behavior is negatively correlated with the willingness to pay for an original when a copy is available. But individuals also make their decisions according to their social neighborhood and to the degree to which they have learned about copying. Furthermore, we find that copiers are motivated by the search for diversified contents, and they are also very concerned about the interests of artists. We then consider the efficiency of anti-copying policies on the copying of music and movies.

1. INTRODUCTION

You should manage your intellectual property to maximize its value, not to maximize its protection. (...) Growing the market is usually more important than extracting the last dime from your existing business model. (Shapiro and Varian, 1998).

By contrast to this assertion, record producers try to enforce at all costs their copyrights over the Internet and in particular against peer-to-peer (P2P) networks. They use various methods to fight against unauthorized sharing – from litigation against individuals to lobbying for copyright reinforcement. In so doing, they try to preserve their basic markets while duplicating their traditional business methods for the electronic delivery of contents. However, by adopting such enclosure strategies, they not only threaten the existence of P2P networks – which have proved to be a much wider innovation than the sole swapping of copyrighted files – but also, perhaps, neglect an important way of increasing their profits.

Furthermore, their very methods might be inefficient. This paper evaluates precisely this idea. Based on a previous study that considers theoretically the economic impact of file sharing (Rochelandet, 2005), it uses an empirical basis to assess this alleged “digital pollution” from the consumer’s viewpoint. By identifying the conditions according to which people using P2P sharing networks are likely to copy to a greater or lesser degree, and then by testing the intensity of copying behavior, our purpose is to evaluate the efficiency of the current enclosure movement.

We thank the members of our research team ADIS-Robinson (www.adis.u-psud.fr/robinson) as well as the participants of the 2005 SERCI Congress for helpful discussions and feedback and an anonymous referee for helpful comments. This work was supported by the French Ministry of Research, program Usage of ICTs and Society and was conducted in partnership with the French consumer union UFC Que Choisir.

The paper is organized in three further sections. The first of these provides a brief survey of the literature we use to explain the intensity of copying behavior. The next section is concerned with highlighting the determinants of this behavior. Particular focus is placed on the roles of individual preferences and social interactions respectively. Section four displays the main results of our econometric test and envisages the policy implications.

2. LITERATURE AND THEORY

Our analysis combines two areas of research, namely the economics of copying and the social interaction literature.

2.1. The economics of copying: The Beckerian perspective. The economics of copying is mainly grounded on the Beckerian framework (Ordovery & Willig, 1978, Besen, 1984, Johnson, 1985, Liebowitz, 1985, 2003, Besen & Kirby, 1989, Takeyama, 1994). These models consider copiers as isolated agents who try to maximize their pecuniary gains.

A consumer's utility function is given by:

$$U = \begin{cases} V_O - P_O & \text{if an original is bought} \\ \alpha V_O - P_C & \text{if a copy is bought} \\ 0 & \text{if neither is bought} \end{cases}$$

where:

V_O is the willingness to pay for originals;

P_O is the price of original, so that $V_O - P_O$ gives the net consumer gain of buying an original;

α is the degree of substitution between an original and its unlawful copies, so that the willingness to pay for copies is given by αV_O , with $0 < \alpha < 1$, so that an original is assumed to be always preferred to a copy.

P_C is the cost of a copy, which are the price of recordable formats (CD-R, DVD-R, etc.) and Internet subscription, so that $\alpha V_O - P_C$ gives the net consumer gain of a copy.

Thus, an individual will copy copyrighted contents when

$$0 \leq V_O - P_O < \alpha V_O - P_C \tag{1}$$

The benefits considered here are mainly of monetary nature. Other studies have nevertheless suggested complementary factors such as information costs (for instance, the costs of organizing a "copyiers club", Besen and Kirby, 1989), psychological costs (ethical concerns; Holm, 2003, likelihood of being caught; Fetscherin, 2005) and search costs for copies and originals. Those "transactions" costs are non-market prices, and so they are difficult to associate with P_O and P_C . Therefore, adding such transactions costs allows the model to be enhanced.

Introducing transactions costs in a simple way, the consumer's utility function is given by:

$$U = \begin{cases} V_O - P_O - C_O & \text{if an original is bought} \\ \alpha V_O - P_C - C_C & \text{if a copy is bought} \\ 0 & \text{if neither is bought} \end{cases}$$

where:

C_O represents the costs associated with buying originals such as information costs of comparing prices, and transportation costs to shops;

C_C represents the costs associated with copying, such as search costs (over P2P networks for instance), the (perceived) costs of being caught (legal risks), and the costs of being contaminated by virus or by some other annoyance. Such costs appear to be the main target of the current strategies of copyright holders against file sharing.¹

Now, equation (1) can be rewritten as

$$0 \leq V_O - P_O - C_O < \alpha V_O - P_C - C_C \quad (2)$$

However, in this framework, copiers are only considered as isolated, timeless agents who try to maximize their monetary gains. In the following, we suggest that their behavior may be explained by another factor, namely social interactions.

2.2. Social Interactions. Models of social interactions suggest that individual choices not only depend on the individual incentives but also on the preferences and expectations of other individuals, i.e. their “neighbors” (see, among others, Manski, 2000, McFadden and Train, 1996, Schiller, 1995, Bikhchandani et al., 1992, Orléan, 1995, Banerjee, 1992, and Kirman, 1992). When payoffs from different actions are unknown or costly to calculate, an individual is more likely to make a given decision if his “neighbors” take the same decision than if they do not. By stating that there is a positive covariance across agents’ decisions, social interactions permit an explanation of a variety of social phenomena such as the adoption of new technologies, fertility choices, criminal activity, and even the choice of academic researchers to work on “hot” topics (Banerjee, 1992). P2P can be currently considered as such a phenomenon. From this rich literature, two concepts seems to be relevant for analyzing copying behavior, namely the phenomena of social contagion and the informational network effect.

2.2.1. Social contagion (local interactions). The notion of social contagion (or neighborhood effects, or peer influences) captures the impact of the social structure of individuals on their behavior, that is: how does the extent of our social contact directly contaminate our beliefs, attitudes and behavior – through word of mouth and observation learning from the behavior of our peers or relevant “neighbors”?

Many explanations have been suggested (Banerjee, 1992, Bikhchandani et al., 1992, Schiller, 1995, Orléans, 1995, among others). By observing others’ actions, an agent could infer that they are motivated by the expectation of some monetary gains or welfare enhancement (for instance, copying as free access to cultural goods, P2P as savings on cultural expenditures). It could then be rational to imitate their behavior. The experience gained from observing others could enable the agent to save on complex calculation costs before making his own choice. Indeed, taking a decision is often a time-consuming activity. Furthermore, imitation permits the social experiences of the other “adopters” to be shared (see Kretschmer et al., 1999, on social contagion in cultural industries) and to reinforce our social links by being able to communicate with one’s peers (for instance, talking about new P2P technologies and swapping the outcomes of such practices).

For example, informational cascades are sequential models that could capture some of those effects. Individuals acquire information by observing the decisions and actions of other individuals belonging to their neighborhood (Bikhchandani

¹In particular, this inequality enables us to understand the current strategies of the record producers, which are essentially focused on decreasing $\alpha V_O - P_C - C_C$ (see Rochelandet, 2005).

et al., 1992). Such behavior could, however, be inefficient: Herding behavior refers to imitative behavior, even when the private information of the imitator suggests taking the opposite decision (Banerjee, 1992, David, 1985).

2.2.2. *Informational network effects (global interactions)*. Neighborhood effects are to be distinguished from informational network effects (Saloner and Shepard, 1995, Arthur, 1994), through which the individual's preferences or decision to adopt a new technology or a behavior are influenced by the size of the installed base of current "anonymous" adopters. In this case, there is no need for direct social interaction. But the more adopters there are, the greater is the utility derived from adoption (peculiarly in uncertain environments). Such an influence is likely to occur in the case of P2P sharing because information about the number of current adopters of any given P2P technology (Kazaa, eMule, etc.) has been somewhat widespread through the media. Furthermore, the new adopters can reinforce their expectations through the software platform itself that often informs users of the total number of users. However, it may be insufficient in itself to explain the decision to share files because knowing the number of P2P users does not inform the potential adopter about the outcomes, neither does it help them to understand how to use such technologies. Experience sharing appears to be a prerequisite to the adoption of copying behavior.

We can modify equation (2) by integrating the impact of social interactions.

Let H be the number of "neighbors" who have already adopt a copying behavior. Now, assume

$$\alpha = \alpha(H) \text{ with } \alpha'(H) > 0 \text{ and } \alpha''(H) < 0 \quad (3)$$

Equation (3) simply states that the preference for copies will increase with the percentage of copiers in the neighborhood of the individual.

We also assume that H does not impact significantly the other variables of equation (2) except for the costs associated with copying C_C :

$$C_C = C_C(H) \text{ with } C'_C(H) < 0 \text{ and } C''_C(H) < 0 \quad (4)$$

That is, search costs and the likelihood of being caught are a decreasing function of the number of copiers belonging to the neighborhood of the individual. Sharing practices are facilitated by the circulation of information about how to use particular sharing technologies, probability to avoid virus contamination, contents to be shared, etc., which in turn increase with the number of actual copiers in the neighborhood.

We assume that the other variables are not influenced by H . Whether or not there are many copiers in the social neighborhood of an individual does not impact the monetary costs associated with buying originals. In the same way, P_O and P_C are market-determined variables, whereas H is a micro-level variable which only affects the preferences of each copier.

3. ECONOMETRIC FRAMEWORK: VARIABLES AND HYPOTHESES

Our model identifies and analyses the factors that could explain the intensity of copying music over P2P networks.² The dependent variable (named *INTCOP*)

²We only consider the copying of music in this paper. But similar results have been obtained about movies.

takes four discrete values: 0 for “never” download music/movies over P2P networks; 1 for “rarely”; 2 for “sometimes”; and 3 for “frequently”.

$$INTCOP \in \{0, 1, 2, 3\}$$

To test the factors that affect the intensity of P2P copying, we use an ordered Logit model (Train, 2003). Choices between copying intensity are mutually exclusive and depend only upon the characteristic of the individual.

According to the above-mentioned literature, the main factors that may explain the adoption of a copying behavior are: (1) the willingness to pay for a copy (denoted by *WTP*) and (2) the neighborhood effect, evaluated by the number of copiers in the social neighboring of the individual (denoted by *HERDING*).

The first factor, *WTP*, represents the sum that the individual would accept to pay for an original of a musical recording when a digitized copy is freely available from his neighbors or through a P2P network. It is expected that *WTP* is negatively correlated with *INTCOP*. This hypothesis is closely related to the economics of copying literature.

The second variable (*HERDING*) refers to the economic analysis of social interaction. The underlying assumption is that the greater is the number of copiers in the social neighborhood of an individual (which he can observe and/or with which he can communicate and share experiences), the more intense is his copying activity over P2P networks (see equations (3) and (4)).

The other independent variables tested in this study may be grouped as follows.

The first group represents demographics (education, socio-professional group/occupation, household structure and income). The increase in age of the respondent is expected to reduce the intensity of copying. Younger people will be more open in their use of newly introduced ICTs. In fact, age usually reflects many other variables favorable to the intensity of a copying activity such as technical skills and income. Furthermore we hypothesize a positive impact of income level on the intensity of copying. The influence of the other demographics could be positive, negative or zero.

The next variable is linked with the location of the individual. It is therefore denoted *LOCATION* and evaluated by urban density as described by the number of inhabitants per square kilometer. To construct this variable, we use equivalent of “zip code” as declared by each respondent. We suppose that high urban density is correlated with a high level of supply of cultural goods, which should negatively impact on copying intensity.

Another group of variables refers to the individual perception about copying. It encompasses ethical concerns, risk concerns, and the perception of cultural diversity associated with file sharing activities. We first consider the ethical concerns (*ETHIC*) of the individual regarding the copying of copyrighted works: Does copying represent a threat to artists’ income and to record production? *ETHIC* indicates the psychological costs the individuals bear when they feel ethically in the wrong when copying. This could unbalance equation (2) by reducing the intensity of copying over P2P networks.

The index *ETHIC* was built by requesting respondents to scale – between “do not agree”, “partially disagree”, “agree” and “fully agree” – their ethical concerns about copying behavior through four questions: “According to you, copying (1) endangers the movie and record markets; (2) affects the income of authors and artists; (3) does not respect the work of authors and artists; (4) is harmful in

itself.” We confer the values 1, 2, 3, 4 for each scaled variable and then add up them.

We also take into account the two main perceived risks associated with copying: that of legal sanctions – denoted by *RISKLEG*, namely the perceived likelihood of being caught and sanctioned – and that of computer risks – denoted by *RISKTECH*, namely the perceived likelihood of being contaminated by a virus or a spyware. For each question, respondents chose between four perceived ordered levels of risk: “no risk”, “low risk”, “medium risk” and “high risk”.

We then test the impact of those heterogeneous perceptions of risks among individuals regarding the intensity of their copying behavior. One key fact to be noted is that a wide campaign against copying was carried out shortly before we began our survey. So it is likely that respondents are quite aware of the risks associated with copying. Thus, we consider the intensity of copying behavior by ordering supposedly well-informed copiers from risk-adverse ones to risk-loving ones. We expect the intensity of copying to decline with the level in the perception of the two risks (see Holm, 2003).

Lastly, the perception of cultural diversity over P2P networks (which we have denoted by *DIVCULT*) is assumed to increase the intensity of copying on sharing networks. *DIVCULT* is a binary variable equal to one if the respondent considers that there is not enough cultural diversity associated with offline or online music sellers, and zero otherwise.

Another major variable that could impact the intensity of copying is the level of cultural spending (denoted by *CULTSPEND*) evaluated by the CD and DVD purchases made by the individual. Its effect could be either negative or positive. On the one hand, there could be a budget constraint: The individual makes trade-offs when allocating his income. Copying could be a way to save on purchases of cultural goods. On the other hand, similarly to cultural practices, a cumulative process could prevail: the greater are the individual’s cultural purchases, the greater are his need for cultural goods, and the more intense would be the copying activity of the individual in order to enjoy larger access to cultural diversity.

The next group of variables indicates the ‘technical environment’ of the individual: her Internet skills (*SKILL*) assessed by the number of hours per day she spends using Internet and her past experience (*PASTEXP*), that is how many years the individual has been making copies. As individuals use a good, or a complementary service, they learn about the value of the item for them, or about how to use it in a more efficient way so that the cost of using it decreases. It is therefore hypothesized that the intensity of copying over P2P networks increases with the level of *SKILL* and *PASTEXP*.

The last group of variables (‘copying behavior’) includes the copying of software (*SOFTCOPY*) and videogames (*GAMECOPY*). We suppose that copying activities are cumulative so that *SOFTCOPY* and *GAMECOPY* impact positively on the intensity of copying over P2P networks.

The following table summaries the independent variables used in our econometric test.

NAME	DESCRIPTION	INTCOP model
DEMOGRAPHICS		
GENDER		indeterminate
AGE		negative
HOUSEHOLD	n° of household members	indeterminate
EDUCATION	Occupation	indeterminate
SOCIO PROF GROUP		indeterminate
INCOME		negative
WTP	The willingness to pay for originals when a digitized copy is freely available	negative
HERDING	The proportion of copiers in the social neighborhood (relationship density)	positive
LOCATION	Urban density	indeterminate
PERCEPTION		
ETHIC	Ethical concerns towards copying	negative
RISKLEG	Perception of the legal risk (of being caught)	negative
RISKTEC	Perception of technical risk (virus contamination)	negative
DIVCULT	Perception of cultural diversity over P2P networks	positive
CULTSPEND	CD and DVD purchases	indeterminate
TECHNICAL ENVIRONMENT		
SKILL	How long the individual has been using the Internet	positive
PASTEXP	How long the individual has been making copies	positive
COPYING BEHAVIOR		
SOFTCOPY	Copying of software	positive
GAMECOPY	Copying of games	positive

4. DATA AND RESULTS

This section discusses the results that were derived from estimating the intensity of copying activity of individuals over P2P networks.

4.1. Sample. We base our analysis on primary data gathered in January and February 2005. 2533 individuals were surveyed using a paper survey and a Web-based survey. To simplify missing data correction, we chose to use the listwise deletion approach (Allison, 2001). Further paper will use multiple imputation procedure for incomplete mixed data (Schafer, 1997). However, the sample bias due to the Web-based survey has been corrected using a post-stratification method implemented

with an SAS software macro named CALMAR and developed by the French national institute for statistics and economic studies (INSEE).³

The description of the sample appears in appendix 1. Note that about 74% of the respondents state that they copy over P2P networks, whereas their willingness to pay for purchasing music is far from being null (0.30 € per track). However, the standard deviation of 0.27 € suggests that the WTP is not greater than 0,6 €: there is a significant request for lower prices of originals.

4.2. Results. Appendix 2 shows the econometric results. The model proves quite robust.

First of all, the variables *HERDING* and *WTP* are significant at 1%. The hypothesized strong positive relationship between the intensity of copying and the number of copiers in the social neighborhood of the individual was supported by the estimation. The opposite relationship holds between the intensity of copying and the willingness to pay for originals.

Other factors are significant at 1%: *ETHIC*, *SKILL*, *DIVCULT*, *SOFTCOPY* and *GENDER*. Two other variables are less significant: *AGE* (only beyond age 31) and *EDUCATION* (significant at 1% but only beyond BS). The other variables are not significant.

As far as the variable *ETHIC* is concerned, it appears that more ethically concerned people hesitate to copy. By contrast, the negative relationship that was expected between the intensity of copying and the perception of legal and technical risks (*RISKTECH* and *RISKLEG*) does not show up empirically here. This kind of result can be explained by the fact that rational copiers know that the actual likelihood to be caught is very small. Concerning the *DIVCULT* variable, it appears that (the perception of) a great diversity of contents over P2P motivates individuals to copy more intensively.

Some indirect network externalities exist: the variable *SOFTCOPY* shows that there is some complementarity of behaviors between music copying and software copying. By contrast, the intensity of copying is not linked with either the copying of video game (*GAMECOPY*), nor with the past experience regarding copying (*PASTEXP*).

Purchases of CDs and DVDs (*CULTSPEND*) are not significant either. From the viewpoint of cultural economics, this phenomenon could be rationally grounded because two opposite effects prevail and seem to neutralize each other: on the one hand, there is a substitution effect between originals and copies and on the other hand, a cumulative logic: copiers are also buyers of cultural goods.

Furthermore, we test the sensibility of CD and DVD purchases vis-a-vis *INTCOP* by sorting by age brackets. None of these tests proves significant: There are no “cumulators” beyond 25 years old, and neither are there any “explorers” or “substituters” under 25 years old. At first glance, this suggests that the results of studies on the copying behavior of college students and the like may not be relevant when a more heterogeneous young population is considered. However, it seems useful to validate our results by carrying out a specific study on a larger basis (a sample greater than 2000 subjects) encompassing young people (less than 25 years old) whatever their current occupation (worker or student). More complex profiles might then appear beyond the simple classification into “explorers” and “substituters”.

³http://www.insee.fr/en/home/home_page.asp. See ‘Classification, Definitions – Methods’ page, ‘Statistical Tools’ page and download CALMAR Macro.

Lastly, demographics on the whole do not explain copying behavior. This seems to be usual in the literature about Internet use. Age and high levels of education are somewhat significant. It seems that gender (being male), is significant, but we shall note that about 78% of the respondents were men. In the same way, location figures among the factors that do not prove significant.

All of these results are summarized in the following list:

- (1) Favorable effects on copying behavior
 - (a) Social neighborhood***
 - (b) Internet skills***
 - (c) Copying of software***
 - (d) Cultural diversity***
 - (e) Being male**
- (2) Unfavorable effects on copying behavior
 - (a) Increasing the WTP for originals***
 - (b) Increasing ethical concerns***
 - (c) Higher education***
 - (d) Increasing age**
- (3) Neutral effects on copying behavior
 - (a) Perception of legal and technical risks
 - (b) Cultural spending
 - (c) Location
 - (d) Experience in copying
 - (e) Socio-professional group
 - (f) Income
 - (g) Diploma
 - (h) Household size

To sum up, copying behavior is negatively correlated with the willingness to pay for an original when a copy is available. This validates the Beckerian approach. But such hypotheses are not sufficient to explain the behavior of copiers. Individuals also take their decisions according to their social neighborhood and the degree of having learned about copying.

Furthermore, our results could challenge the grounds for the current policies towards unauthorized sharing.

4.3. Policy implications. Our study has some policy implications, in particular regarding the dominant strategy of the copyright industries, that consists mainly of fighting against P2P file sharing. The legal framework has been reinforced in order to support them. However, this enclosure movement could be all the more detrimental in terms of welfare losses since nothing clear has been demonstrated about the alleged social cost of digital copying and it is all the more problematic since alternative arrangements exist (Rochelandet, 2005).

By swapping copyrighted contents through physical or digital networks, individuals draw some utility derived from rapid access to works, greater diversity and reduced search costs. As for content producers, they could bypass traditional intermediaries and thereby increase their profit margin. Finally, P2P networks organize a circulation of works among Internet users on an unprecedented scale. All these benefits should be taken into account when evaluating the social impact of illegal file sharing.

However, whether or not P2P file sharing represents a social loss, this study suggests that tackling it by using legal means and reinforcing copyright law may be inefficient. From our viewpoint, copyright stakeholders should focus on designing new business models to compete with P2P networks and other sharing technologies.

Firstly, herding behavior can favor the expansion of sharing practices in spite of the copyright reinforcement (increased sanctions, stronger liability rules, and so on). It depends on the sensitivity of current users – particularly, 'fashion leaders' – to such signals. And precisely our study suggests that the perception of legal risks is not significant. In some respect, prevention campaigns could be more efficient because ethical concerns affect the intensity of copying.

More generally, we have shown elsewhere that P2P sharing is only a small part of copying behavior: it is mainly grounded on more general copying practices. Unauthorized sharing is primarily embedded in social networks: family, friends and office. In other words, file-sharing and physical exchanges of CD and MP3 files (for instance from a mobile phone to a PC) are strongly correlated. Therefore, fighting only P2P is not only insufficient to eradicate file sharing in the long run but also somewhat iniquitous. From both positive and normative viewpoints, the majors have to eliminate all kinds of sharing behaviors (if one considers that they actually result in a net social loss).

Secondly, the strategies taken by the majors may constitute all the more a social cost since P2P file sharing networks could be the basis upon which to build new markets as suggested by our valuation of WTP. Record and movie producers should focus on increasing the willingness to pay for originals (e.g. by supplying new formats).

Finally, P2P users search for a certain level of access to diversity of works. In comparison with P2P supply, the current models of online delivery such as iTunes seem to suffer from a lack of cultural diversity. Instead of reinforcing copyright, governments should care about stimulating competition by eliminating barriers to entry in those new markets as it prevails in the CD and DVD markets.

5. FURTHER DEVELOPMENTS

By using an ordered LOGIT model this paper explains the intensity of copying over P2P networks. Some results, such as the impact of social interaction, prove to be robust. Nevertheless, some improvements are required to explore new avenues of research. The first step consists in improving the robustness of the results by building and testing other independent variables such as *PROXICULT* which will assess the influence of the distance between the individual and the retail infrastructure dedicated to cultural goods on her copying activity.

Moreover, the implementation of ordered qualitative models is subject to important caveats. In particular, it is assumed that coefficient linking an independent variable value to the different outcomes will be the same across all outcomes (Borooah, 2001). This assumption must be tested using an alternative multinomial Logit model.

Lastly, a further step is to recoup our results concerning willingness to pay for originals when copies are freely available (TOBIT model) and to test the determinants of cultural spending including the intensity of copying.

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Appendix 1: Description of the Sample.

VARIABLES	DESCRIPTION	MEAN or %	MIN	MAX
INTCOP	0: never download music/movies over P2P networks	26.21%	0	1
	1: rarely download music/movies over P2P networks	22.66%	0	1
	2: sometimes download music/movies over P2P networks	27.64%	0	1
	3: frequently download music/movies over P2P networks	23.49%	0	1
Gender (Ref=Male)		78.04%	0	1
Age	<25	22.58%	0	1
	25-30	19.05%	0	1
	31-40	23.17%	0	1
	41-50	15.46%	0	1
	> 50	19.74%	0	1
Education	<BAC (<i>less than BAC/BAC Pro</i>)	10.78%	0	1
	BAC / BAC Pro (<i>high school graduate, business, technical</i>)	16.61%	0	1
	BAC +1 +2 - <i>some college (no 4-degree)</i>	25.97%	0	1
	BAC +3 +4 - <i>BS or more</i>	21.53%	0	1
	≥ BAC +5 - <i>MA</i>	25.1%	0	1
Socio-professional group	Free lance, executive	35.41%	0	1
	Intermediate occupation, skilled workers, workers	27.56%	0	1
	Retired	7.68%	0	1
	Students	11.38%	0	1
	Unemployed, others	17.98%	0	1
Household size	Number of individuals	2.73 (<i>sd=1.36</i>)	1	7
Income	Bad living with current income	32.09%	0	1
	Normal living with current income	44.5%	0	1
	Good living with current income	23.38%	0	1
WTP (musical recording)	Euros (€)	0,308 (<i>sd = 0,276</i>)	0 €	0,9 €
Herding (index)	Nobody or 'don't say'	15,78%		Due to missing data problem, <i>HERDING</i> is treated as an index variable from level 1 to 4. This approach does not change our conclusions.
	1-5 individuals	26,37%		
	6-15	18,75%		
	>15	39,10%		
	Location (Density)	Inhabitants/km2	5227 (<i>sd=7709</i>)	1
ETHIC (index)		6.39 (<i>sd=2.61</i>)	4	16
Legal risk	Null	10,51%	0	1
	Low	34,13%	0	1
	Average	35,70%	0	1
	High	19,66%	0	1
Technical risk	Null	17,17%	0	1
	Low	30,73%	0	1
	Average	26,21%	0	1
	High	25,90%	0	1
Cultural diversity (Ref=1=yes)		59,61%	0	1
Monthly purchase Cultural goods	<20 €	40,17%	0	1
	20-40 €	32,72%	0	1
	41-60 €	13,45%	0	1
	60-100 €	7,79%	0	1
	More than 100 €	5,86%	0	1
Internet skill	< 10 minutes per day	3,75%	0	1
	From 10 minutes to < 1 hour per day	20,54%	0	1
	from 1 to 2 hours	26,37%	0	1
	More than 2 hours	49,34%	0	1
Past experience in copying (index)	< 1 year	11,60%		Copying experience variable is treated as an index from level 1 to 5.
	1-2 years	16,83%		
	2-3 years	28,38%		
	4-10 years	38,92%		
	> 10 years	4,28%		
Software copying (Ref=1=yes)		75,51%	0	1
Game copying (Ref=1=yes)		45,61%	0	1

Appendix 2a: The Determinants of the Intensity of Copying Behavior (odd ratios).

GROUPS		GENERAL MODEL	DEMOG	WTP
DEMOGRAPHICS	GENDER (Ref: man)	1,28** (1,98)	2,33*** (8,74)	2,31*** (8,55)
	AGE (Ref: <25)			
	25-30 years	0,81 (-1,22)	0,76* (-1,92)	0,76* (-1,91)
	31-40 years	0,7** (-2,01)	0,51*** (-4,52)	0,53*** (-4,24)
	41-50 years	0,53*** (-3,25)	0,37*** (-6,15)	0,39*** (-5,66)
	> 50 years	0,34*** (-4,97)	0,21*** (-8,94)	0,22*** (-8,5)
	EDUCATION (Ref: <BAC)			
	BAC / BAC Pro	1,23 (1,15)	1,02 (0,16)	1,02 (0,16)
	BAC +1 +2	0,77 (-1,55)	0,7*** (-2,59)	0,72** (-2,37)
	BAC +3 +4	0,63*** (-2,67)	0,64*** (-3)	0,65*** (-2,94)
	≥ BAC +5	0,58*** (-2,95)	0,55*** (-3,87)	0,58*** (-3,51)
	SOCIO-PROFFESIONAL (Ref: executive)			
	Intermediate occupation...	1,19 (1,36)	0,99 (-0,12)	1 (0,05)
	Retired	0,94 (-0,26)	0,82 (-1)	0,83 (-0,95)
	Students	0,95 (-0,31)	1 (0,02)	0,99 (-0,07)
Unemployed, others	1,17 (0,88)	0,97 (-0,22)	0,94 (-0,42)	
HOUSEHOLD STRUCTURE	0,99 (-0,3)	0,99 (-0,3)	0,99 (-0,28)	
INCOME (ref: Bad living...)				
Normal living with current income	0,92 (-0,82)	0,85* (-1,86)	0,87* (-1,68)	
Good living with current income	1 (-0,03)	0,92 (-0,78)	0,92 (-0,75)	
WTP		0,89*** (-6,61)		0,87*** (-10,13)
HERDING		1,24*** (4,59)		
LOCATION		1 (0,3)		
PERCEPTION	ETHIC	0,92*** (-4,2)		
	LEGAL RISK (ref: null)			
	Low	0,9 (-0,62)		
	Average	1,14 (0,81)		
	High	1,23 (1,18)		
	TECHNICAL RISK (Ref: null)			
	Low	1,2 (1,37)		
Average	1,11 (0,71)			
High	1,08 (0,55)			
CULTURAL DIVERSITY	1,56*** (4,81)			
CULTURAL SPENDING (ref <20 €)	20-40 €	1,01 (0,06)		
	41-60 €	0,76** (-1,93)		
	60-100 €	0,8 (-1,29)		
	More than 100 €	1,16 (0,77)		
TECHNICAL ENVIRONMENT	INTERNET SKILL (ref: < 10 minutes per day)			
	From 10 minutes to 1 hour	2,98*** (3,86)		
	From 1 to 2 hours	5,27*** (5,93)		
	More than 2 hours	6,37*** (6,69)		
PAST EXPERIENCE	0,98 (-0,48)			
COPYING	SOFTWARE COPYING	1,41*** (2,72)		
	GAME COPYING	1,09 (0,83)		
	LL	-2316,06	-3307,51	-3242,9
	N	1858	2504	2492
	PSEUDO R2	0,1	0,04	0,06
	ANCILLARY PARAMETERS	c1 : -0,10 c2 : 1,17 c3 : 2,68 se : 0,44	c1 : -1,53 c2 : -0,45 c3 : 0,87 se : 0,21	c1 : -1,94 c2 : -0,82 c3 : 0,53 se : 0,22

*: Significant at 10%, **: Significant at 5%, ***: Significant at 1%. (...) Student coefficient.

Appendix 2b: The Determinants of Copying Behavior (odd ratios).

GROUPS		HERDING	LOCATION	OTHER VARIABLES	NO DEMOG
DEMOGRAPHICS	GENDER (Ref: man)	2,21*** (8,14)	2,27*** (7,91)	1,33*** (2,49)	
	AGE (Ref: <25)				
	25-30 years	0,79 (-1,61)	0,85 (-1,01)	0,7** (-2,31)	
	31-40 years	0,61*** (-3,31)	0,56*** (-3,58)	0,54*** (-3,74)	
	41-50 years	0,47*** (-4,58)	0,4*** (-5,14)	0,39*** (-5,31)	
	> 50 years	0,3*** (-6,74)	0,23*** (-7,84)	0,24*** (-7,27)	
	EDUCATION (Ref: <BAC)				
	BAC / BAC Pro	0,96 (-0,27)	1,01 (0,05)	1,23 (1,26)	
	BAC +1 +2	0,65*** (-3,03)	0,73** (-2,12)	0,71** (-2,27)	
	BAC +3 +4	0,59*** (-3,54)	0,6*** (-3,19)	0,66*** (-2,58)	
	≥ BAC +5	0,51*** (-4,39)	0,5*** (-4,19)	0,6*** (-3,08)	
	SOCIO-PROFESSIONAL (Ref: executive)				
	Intermediate occupation...	0,99 (-0,12)	1,03 (0,26)	1,13 (1,05)	
	Retired	0,91 (-0,51)	0,8 (-1,08)	0,89 (-0,55)	
	Students	1,14 (1,05)	1,01 (0,05)	0,9 (-0,73)	
	Unemployed, others	0,99 (-0,09)	1,1 (0,56)	1,04 (0,21)	
HOUSEHOLD STRUCTURE	0,99 (-0,44)	0,99 (-0,2)	0,99 (-0,31)		
INCOME (ref: Bad living with current income)					
Normal living with current income	0,83** (-2,11)	0,88 (-1,35)	0,88 (-1,4)		
Good living with current income	0,89 (-1,07)	0,88 (-1,08)	1,08 (0,66)		
WTP				0,88*** (-7,29)	
HERDING		1,38*** (8,37)		1,38*** (7,37)	
LOCATION			1 (1,94)	1 (0,58)	
PERCEPTION	ETHIC			0,89*** (-6,26)	0,93*** (-3,52)
	LEGAL RISK (ref: null)				
	Low			0,87 (-0,92)	0,86 (-0,98)
	Average			1,05 (0,3)	1,12 (0,69)
	High			1,14 (0,81)	1,29 (1,45)
	TECHNICAL RISK (Ref: null)				
	Low			1,22* (1,68)	1,14 (1,02)
	Average			1,15 (1,1)	1,05 (0,38)
	High			1,16 (1,16)	1,04 (0,28)
	CULTURAL DIVERSITY				
				1,48*** (4,67)	1,61*** (5,29)
CULTURAL SPENDING (ref: <20 €)	20-40 €			0,96 (-0,46)	1 (-0,04)
	41-60 €			0,76** (-2,17)	0,74** (-2,22)
	60-100 €			0,83 (-1,17)	0,78 (-1,49)
	More than 100 €			1,15 (0,79)	1,14 (0,7)
TECHNICAL ENVIRONMENT	INTERNET SKILL (ref: < 10 minutes per day)				
	From 10 minutes to 1 hour per day			2,72*** (3,77)	2,98*** (3,93)
	From 1 to 2 hours			4,74*** (5,92)	5,27*** (6,04)
	More than 2 hours			6,04*** (6,92)	6,72*** (7,01)
COPYING	PAST EXPERIENCE			1,01 (0,2)	1,01 (0,14)
	SOFTWARE COPYING			1,54*** (3,79)	1,27** (1,97)
	GAME COPYING			1,1(0,99)	1,35*** (3,08)
	LL	-3269,5	-2769,27	-2816,85	-2371,46
	N	2502	2107	2213	1867
	PSEUDO R2	0,06	0,05	0,08	0,08
	ANCILLARY PARAMETERS	c1 : -0,90 c2 : 0,20 c3 : 1,55 se : 0,23	c1 : -1,42 c2 : -0,35 c3 : 0,99 se : 0,23	c1 : -0,53 c2 : 0,71 c3 : 2,15 se : 0,41	c1 : 0,78 c2 : 2,02 c3 : 3,48 se : 0,36

*: Significant at 10%, **: Significant at 5%, ***: Significant at 1%. (...) Student coefficient.

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