IMPORTANCE OF CULTURAL AND RISK ASPECTS IN MUSIC PIACY: A CROSS-NATIONAL COMPARISON AMONG UNIVERSITY STUDENTS

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ABSTRACT

Using a conceptual model of piracy, this paper identified four categories of factors which influence consumer behavior with respect to music piracy: economic, demographic, risk, and culture. A particular emphasis was placed on the importance of cultural and risk aspect in music piracy in this paper. It takes into account a large sample of micro-level behavioral data of university students from the U.S. and Switzerland. We show that despite the fact that these countries are two western, industrialized and technologically advanced nations, students have differences in national culture and they view and treat copyright differently, which ultimately affects the propensity to engage in music piracy. Our results show that consumer behavior can differ even among developed and technologically advanced countries. We show that compared to Swiss students, American students are more likely to engage in music piracy. With respect to the demographic factors, male students are more prone to piracy, whereas older students are less likely to engage in such activity. Finally, the key risk variables perceived probability of getting caught when conducting such illegal activity and the resulting penalty to be paid are negatively associated with music piracy behavior. This paper provides important insights which can be used to have tailored policies to alleviate piracy behavior in each country.

Keywords: copyright, consumer behavior, culture, piracy, risk

1. Introduction

People from different societies or cultural backgrounds have various perspectives of how individuals perceive, react and respond to activities that carry risks, either physical or legal. This represents the cultural norms that individuals learn, among others, in their childhood and their social-environment when they grow up, and it plays a significant role in the way they behave. This paper looks at music piracy over networks like the Internet (e.g., peer-to-peer file sharing), with a specific focus on the importance of culture and risk aspects on the consumer piracy behavior. Prior studies on the determinants of piracy have focused primarily on the role of costs and monetary constraints along with risk perceptions. Yet, virtually no study has incorporated culture and risk perception as variables to explain how an individual's behavior is influenced by one's relatives, peers, and social-environment, which ultimately affect actual behavior.

Measures to address piracy cannot be effectively developed without knowing the underlying motivations for individuals to engage in such activity. In this paper, we investigate the root causes of individual piracy behavior by identifying key factors influencing this behavior, with emphasis on how cultural and risk variables influence the piracy behavior. Using a large set of survey data of students from the U.S. and one from Europe with Swiss students, we examine the differences in cultural and risk perceptions that ultimately determine piracy behavior. University students are an ideal target for this purpose because they exhibit many homogeneous consumption habits along with significant peer interaction. University campuses have been reported as being a place of massive illegal file sharing due to their technological infrastructure, high speed Internet access, and the fact that students account for a considerable proportion of all consumers where copying and sharing are prevalent [Bhattacharjee, et al. 2006]. Many students have greater knowledge and access to engage in file-sharing compared with other groups of the adult population, which make them of greater interest for a study of this kind as they consume large amounts of digital content. Thus, the target subjects of this study are students, a group that has already been spotlighted as being more prone to copyright violations than the general public and which has already been used in other studies dealing with intellectual property and piracy [e.g., Swinyard, Rinne, and Kau 1990; Cheng, Sims and Teegen 1997; Gopal and Sanders 1998; Goodwin and Goodwin 1999; Holm 2003; Bhattacharjee et al. 2006; Chiang and Assane 2007].

The results and policy implications gained from this study can also be applied to other target groups, such as teens who are influenced by similar factors to engage in piracy and many of whom might also become college students. Therefore, addressing and analyzing this issue can assist not only those within the industry but also policy makers within the government who can develop strategies to combat piracy. In the remainder of the

paper, we discuss piracy and its causes, then we present the conceptual model, data, empirical framework, and results. We conclude with a policy discussion and avenues for further research.

2. Copyright Piracy and its Causes

Individuals are presented with a wealth of methods and channels to acquire digital goods such as music, film, and software. These consist of legal channels such as traditional store purchases and web-based downloading sites such as iTunes as well as peer-to-peer filesharing systems like the new Napster. However, consumers also have a wide variety of ways to acquire digital goods from illicit channels such as via websites, peer-to-peer (P2P) file sharing networks, blogs, Internet relay chat (IRC), or Lan-Parties. In the music industry, sales of legal music downloads have grown substantially; for example, iTunes announced it had sold its one billionth song at the end of 2006. Yet, despite the promising trend, piracy for the content industry remains a substantial problem where the International Intellectual Property Alliance (IIPA) estimated that global annual losses due to piracy of copyrighted digital goods in 2006 exceeded $56 billion, with software piracy accounting for $34 billion [Business Software Alliance 2007], music piracy for $4.6 billion [International Federation of the Phonographic Industry 2006], and film piracy for $18.2 billion [Nyam and Ng 1994]. While these figures need to be interpreted with caution, piracy is still an important issue not only for the content industry, but also for policy makers who are increasingly involved in the protection of intellectual property rights (IPR).

The literature on copyright piracy can be broadly placed into those studies that focus on piracy on an aggregate level using macro-data and those studies focusing on the individual level using micro level data. On an aggregate level, many studies [Rapp and Rozek 1990; Mansfield and Lee 1996; Ginarte 1997; Lee 2000; and Maskus 2001] found negative correlations between measures of a nation's income and its national piracy rate. Complementing these studies, Burke [1996], and Silva and Ramello [2000] found that countries with higher levels of economic development exhibited lower overall levels of piracy. Stegemann [2000] and Stolpe [2000] found that countries with high export shares tend to respect copyrights more because they have more at stake from foreign countries and fear repercussions resulting from copyright violations.

In addition to economic factors, studies have related piracy with non-economic factors. Givon et al. [1995] as well as Slive and Bernhardt [1998] tied the increase of piracy to the expanding user base of products complementary to copyright goods (e.g., computers and CD-players). Gallegos [1999] found that software piracy increased at an explosive pace as Internet access expanded. From a legal perspective, Burke [1996] as well as Ginarte and Park [1997] found that countries participating in international agreements to strengthen IPR laws, such as the Paris and Berne Conventions, are associated with lower levels of piracy. More recently, studies have identified culture as a factor influencing piracy. For example, Ronkainen [2001] and Moores [2003] followed the Hofstede approach of proposing "cultural dimensions" in explaining piracy. These studies found piracy to increase with a society's level of economic inequality, political uncertainty, and social collectivism. Lastly, there is increasing attention placed on the differences in piracy across countries. Van Kranenburg and Hogenbirk [2005] showed that countries with greater economic and political stability corresponded with less piracy.

We argue in this paper that understanding consumer piracy behavior requires greater emphasis on micro-level than macro-level data, which the literature tends to lack. Cheng et al. [1997] found the main factors motivating individuals to pirate software to be cost and curiosity (i.e., to sample software). Chiang and Assane [2007] found that within a college environment, students are influenced by their peers (i.e., peer effects) which results in a greater propensity to engage in piracy. Kwong and Lee [2004] found Internet experience to be positively correlated with the likelihood of music piracy. Fetscherin [2005] showed that variables explaining piracy behavior consist of economic and risk factors. Specifically, individuals who are less worried about the risk of being caught downloading pirated music have a greater percentage of music consisting of illegal downloads, while those with higher incomes have a lower percentage.

With respect to cross-national dimensions, most studies either lack such variables or are limited in their analysis; for example, Gopal and Sanders [1998] studied software piracy using basic data from the U.S. and India to conclude that the actions of Indian students did not conform to any standard ethics model. Lin et al. [1999] found that piracy is influenced by subjective norms based on organizational ethical climates as well as by de-individuation resulting from computer usage. Turning to organizational ethics, Shore et al. [2001] evaluated attitudes toward software piracy by students in four countries and found piracy to be an ethical problem that is country-dependent.

While much of the literature focuses on one or two important factors of piracy behavior, there has been little research on how the different factors interact with one another and how culture and risk perception affect the underlying piracy behavior. Among others, the lack of research may be due to difficulty acquiring data as well as data comparability. In this paper, we build upon the existing literature by developing and implementing a survey that incorporates a variety of factors influencing copyright piracy behavior among students. Our paper focuses on the music industry.

The university campus is an opportune location to study the extent of piracy. In addition to choosing a university setting, we also compare students between two countries which enables us a cross-national comparison. The ability to perform survey work across countries requires the ability to adequately collect data in a uniform fashion that includes the ability to overcome language and cultural differences in order to have comparable cross-cultural data. In order to show the importance of national culture and risk perspectives between countries, we use two developed and technologically advanced western countries. This study takes into account the U.S. and Switzerland where the authors have strong ties and which represents therefore a convenience sample. However, if we are able to show that national culture and risk perceptions and the underlying piracy behavior are significantly different between these countries, it would show that cultural differences play an influential role on piracy behavior. The following section develops a simple model of piracy that depends on four groups of factors, consisting of economic, demographic, risk, and cultural variables that affect individual's piracy behavior.

3. Conceptual Model

Most prior studies dealing with digital content and piracy have focused on software rather than on music piracy [Sims et al. 1996; Chen and Png 1999; Andres 2002; and Katz 2006]. Those focusing on music have primarily looked at the implications of piracy on social welfare or the content industry, and strategies to fight piracy [Burke 1996; Buhse 2001; and Bhattacharjee et al. 2006]. The few papers known so far about consumer trade-offs between purchasing and pirating content lack empirical evidence, particularly on the cultural and risk aspects of piracy, which we address in the following model.

In our conceptual model, we distinguish between two options for consumers to acquire digital music: Purchase of the original or copy the original. Though we are analyzing the same good in two different markets, there are differences (e.g., in quality) between the goods that make them substitutes in the view of the consumer, but not perfect substitutes [Shapiro and Varian 1998]. This assumption enables us to keep our conceptual model linear and easier to understand and interpret the results. The overall demand for music can be illustrated as in Figures 1a and 1b as consisting of a legal market and an illegal market, respectively, for a prospective consumer. In each market, there exists a willingness to participate in that market that is based on the individual tradeoff between the utility and the price, both monetary and non-monetary [Fetscherin 2006]. The difference between the price and the utility is the corresponding net utility.

In Figure 1a, the demand curve represents the utility and the price for an original music song. The price of P_L represents the average price to pay for music purchased in the legal market. In Figure 1b, the demand curve represents the utility for the copy or pirated version of the original. The model assumes that the copy of the original can be acquired for free which would initially put the price for the copy at zero. However, so called Digital Rights Management Systems (DRMS) with the usage of watermarking and fingerprinting technologies make it possible to detect and track copyrighted content more easily. Therefore, those systems allow better identification of users who are copying and sharing illegally copyrighted content. The model assumes that DRMS increase the probability of being caught, along with the degree of law enforcement and penalties in the given country which makes it possible to prosecute copyright infringement. Copying illegally from unreliable networks also exposes consumers to a certain risk of acquiring computer viruses, which can either make the downloaded file unplayable or even damage the computer [Fetscherin 2006]. Hence P_I is determined mostly by non-monetary factors such as the perceived risk of being caught, the potential penalties, as well as the perceived risk of acquiring a virus when downloading an illegal version of an original.

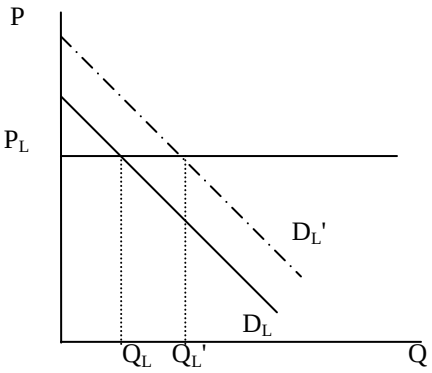

Figure 1a. Legal Market

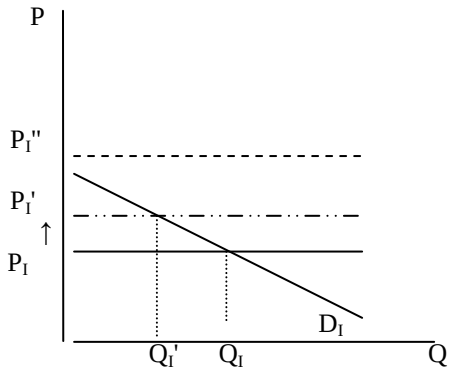

Figure 1b. Illegal Market

Note that the demand curves in each market and the "prices" in the illegal market will vary with each individual. As such, consumers have two different reservation prices or willingness to pay (WTP), one

corresponding to each market, both depending on the various factors. The level of participation in each market is measured by the quantity where price meets the demand curve, ultimately determines the level of purchases and piracy.

Assuming that consumers choose between the legally purchased song and a (illegal) copy of the same song, the relationship between the markets occurs when an individual is not willing to pay for the legal version of the music, but is willing to acquire a copy of it (or vice versa). Thus, the greater the demand and the lower the price in Figure 1b, the more likely one would resort to acquire a copy.

Many factors influence the consumer's utility and the price in terms of monetary or non-monetary costs for both markets. For example, efforts to discourage piracy via technological solutions such as DRMS and law enforcement would likely increase the "price" in the illegal market (e.g., increasing P_I to P_I' in Figure 1b). Further, it is important to note that the two goods are assumed to be substitutes for one another, such that increasing P_I in the illegal market would affect the cross elasticity of demand by increasing demand in the legal market. For example, if P_I increases to P_I' (Figure 1b), Q_I falls to Q_I'; subsequently, in the legal market demand would increase from D_L to D_L' (Figure 1a), and quantity consumed would increase from Q_L to Q_L'. If a consumer perceives a higher risk of being caught and prosecuted for acquiring copies, their reservation price may further increase up to the price P_I'' where no piracy would occur. Using this simplified model, we can examine how various factors based on economic, demographic, risk, and cultural variables can affect the legal and illegal markets for music and the overall level of piracy. Each of these categories of variables is discussed in the following sections.

3.1. Economic Factors

Income-related factors are commonly used in the literature on piracy to provide insight into the ability to pay for copyright products, with the common presumption that higher levels of income correspond to less piracy. In a university setting where educational costs vary while sources of income can include work, scholarships, financial aid, or parental support, disposable income varies significantly among students. We use the variable INCOME, which indicates whether a student works full-time, part-time, or not at all, as a loose proxy for disposable income. While students who work may not necessarily have more disposable income (i.e., if other monetary sources are not available to offset the costs of attending a university), we include this variable to control for access to money in general.

Another approach to measure affordability is to determine the demand for acquiring the original music, which depends on the relationship between the price and utility of legal downloads and the utility and non-monetary costs associated with illegally downloaded music. In a related study, Parthasarathy and Mittelstaedt [1995] found that piracy is largely influenced by the reduction of non-monetary costs that result from the success of the product itself. In other words, the authors imply that network externalities play an important role in determining the extent of piracy. In a separate study, Chiang and Assane [2002] found low price elasticities of demand for legal music downloads among university students, adding support to the notion that non-price factors play an important role in the piracy market. Assuming that consumers weigh the utility of legal downloads with the non-monetary costs of illegal downloads, the propensity to purchase music would be reflected by an individual's willingness to pay (WTP) for a fee-based music download (or equivalent if purchased in a store). Also INCOME and WTP may be correlated, we expect both to exhibit a negative relationship with piracy.

3.2. Demographic Factors

Demographic factors include those of GENDER, AGE, and CLASS standing of students. The premise that these factors influence piracy derives from the criminal and ethics literature [Buonanno 2003]. Several studies have emphasized demographic factors in relation to piracy. Wood and Glass [1995] and Sims et al. [1996] find that males are more likely to pirate software compared to females, while Nyam and Ng [1994] find that older individuals are less tolerant of unethical behavior than younger individuals. If we assume that these studies serve as a predictor for behavior within a college age population, we would expect that younger male students are more likely to engage in music piracy.

3.3. Risk Factors

There is a wide range of literature looking at risk behavior. The seminal economic study by Becker [1968] incorporated risk as the main factor in determining the propensity of criminal behavior, and argues that crime can be justified using an economic rationale. Since then, a number of researchers have studied the formation of risk perceptions and their resulting effect on risky activities (for example, smoking [Viscusi 1991]). In the case of music piracy, laws that protect copyrights and enforcement of those laws are the mechanisms used by the government as well as industrial groups to discourage piracy. Most studies on piracy recognize the importance of the legal system, and that laws and the level of enforcement vary greatly by country. Swinyard et al. [1990] contended that copyrights have their roots in Western values that protect individual ownership and show that Americans pirate less than Singaporeans. When individuals download music illegally, they face a risk of being caught and prosecuted as witnessed in recent years with the advent of lawsuits against individuals accused of music piracy. Levin et al. [2007] showed that the use of threats (e.g., fines and jail sentences) is more effective

in curtailing piracy than the strategy of informing consumers of the harm piracy places on artists and the recording industry. In another study of 2,000 music file-sharers, Bhattacharjee et al. [2006] showed that while enforcement measures reduced file-sharing levels, the availability of files was mostly unchanged.

This paper incorporates variables reflecting risk. Risk can be realized by the probability of getting CAUGHT along with the associated PENALTY one endures if caught. Much of the literature, beginning with Becker [1968], suggests that individuals react more to the perception of being caught rather than to the perceived severity of penalties. This is logical given that one must first be caught before penalties are levied. We expect risk variables to be negatively correlated with piracy; however, we must also consider how risk itself is influenced by external factors and the perceived extend of loss, hence we include an instrument variable (WARRANTY) to account for possible endogeneity of risk and the perceived extent of loss. This variable, measuring whether one purchases optional extended warranties on major purchases, provides one more independent assessment of risk perceptions among consumers.[1] Also this variable is a proxy of risk preference further studies might take other variables to assess this.

3.4. Cultural Factors

We introduce a category incorporating cultural factors that are frequently omitted in prior studies on piracy. Culture is a powerful force in regulating human behavior, yet its influence is often taken for granted. Many studies have focused on how cultural factors affect consumer behavior. For example, Wallace [1965] provided one of the first studies relating consumer behavior to culture by examining how values formed by social peers affect the products one purchases. In subsequent studies, Hoover et al. [1978] found differences in consumption patterns between people of various ethnic groups, while Gentry et al. [1988] found differences in consumption between subcultures. For example, the authors found that individuals in regions that exhibit greater religious commitment are more hesitant to try new products. In addition to its effect on consumer behavior, culture is also frequently tied to ethics. With respect to piracy, one must look not only at the cultural aspect of consumer behavior, but also that of ethical behavior. There are many studies on ethics, for example, in the cross-cultural psychology literature that find a relationship between culture and ethical behavior of individuals. Armstrong and Sweeney [1994] investigated differences in ethical perceptions among Australian and Hong Kong managers, and found that the culture of the respondent country had the most significant effect on the prediction of ethical problems. Goodwin and Goodwin [1999] compared attitudes toward ethical dilemmas among business students in Malaysia and New Zealand, and also found differences stemming from national origin. Despite its relevance to copyright piracy, there are almost no studies tying national culture to factors influencing piracy behavior.

Incorporating culture, even measured by a single proxy "national culture", into piracy behavior involves determining how it affects individual behavior. The Hofstede approach argues that national culture is carried by all individuals in a nation and reflects the overall and main shared values and beliefs formed during childhood and reinforced throughout life [Shore et al. 2001]. According to the Triandis model [1995] and its subsequent adaptation by Lee [2000], consumer behavior is influenced by three main elements: subjective culture (i.e., how a culture perceives the need for protecting copyrights), situation (i.e., influence of physical and social surroundings of an individual), and past experience (i.e., childhood and influence from family and friends). This paper uses the Triandis model to identify cultural variables affecting piracy behavior. Also Hofstede's cultural dimensions provide some insight, the Triadis model and underlying questions enable to operationalize culture in the survey more easily.

The first element, subjective culture, is likely to be captured from the national perspective of copyright law; in other words, how a country builds its social norms with respect to piracy. In our model we include a binary variable COUNTRY to capture non-controlled country differences between the U.S. and Switzerland. These cultural differences between students and their government environment can include factors such as the prevalence of copyright awareness campaigns, enforcement of related copyright violations such as plagiarism, along with the availability of websites and other informational sources in one's language. In the U.S., the RIAA and MPAA devotes substantial resources and time to anti-piracy campaigns, prosecuting people and hiring anti-piracy companies which flood P2P networks with corrupt files to discourage people using such networks as well as to search and track people conducting piracy [Knolmayer and Fetscherin 2004]. Copyright owners have also developed anti-plagiarism software such as Turn-It-In, all these measurements having the objective to increase piracy awareness and to discourage people to pirate more. In Switzerland due to legal regulations some of these measurements are not allowed. As a result, the relationship between COUNTRY and piracy could be positive.

The second element from Lee [2000] is situation which is captured by various peer effects, which refer to the ability to learn and be influenced by their peers. For example, individuals learn from peers how to download music; such peers are prevalent on the university campus where large groups of like-minded individuals interact daily. This argument differs from that of Kwong and Lee [2004], who argued that virtual communities play a

[1] While many individuals may pay little attention to warranties, individuals are almost always asked (at times aggressively) when purchasing items such as computers, cars, appliances, and electronics whether an extended warranty is desired. And based on our survey results, certain students do in fact purchase or at least consider these warranties, which we argue provides evidence of risk preferences. This is valuable because this variable is less likely to be influenced by causality than the variables CAUGHT and PENALTY.

larger role in piracy (individuals sharing copyrighted content on networks). We argue that though the size of virtual communities plays a role, the root of piracy behavior lies in the knowledge and ability to share which occurs prior to the actual act; in other words, the 'physical' community that provides the knowledge to engage in piracy. Arising from this is a moral aspect - the interaction of individuals within a physical community that contributes to the ideals of whether downloading music is considered illegal. Thus, we include this factor which asks students whether Internet sites facilitating music piracy should be shut down (SHUT). This variable has been taken into account in order to assess the perception of respondents whether such website providing illegal music download is morally and ethically acceptable for them and if they approve or disapprove such illegal activity. We expect responses in the affirmative would result in less piracy. We also test how culture influences an individual's knowledge of current policies; for example, an individual's exposure to news of copyright prosecutions. We therefore include knowledge (KNOWN) of copyright prosecutions, and expect higher responses to result in less piracy as individuals tend to be risk averse.

The last element from Lee [2000] in our model is past experience. In our model we use the variable CHEAT, which measures the propensity of cheating on exams, as a proxy to reflect cultural values influenced from one's upbringing. It is assumed that students who are more likely to consider cheating or plagiarism to also be more prone to copy copyrighted content such as music [Sims et al. 1996; Peace, Galletta and Thong 2003; Rawlinson and Lupton 2007].

4. Data collection

The data were obtained from a large sample of students from universities in the U.S. and Switzerland between January and March of 2004 using a survey. Pre-tests were conducted prior to the data collection with a small sample of respondents in order to assess the survey's reliability and to modify any questions that may create confusion. To avoid a selectivity bias of a particular group, students surveyed were selected at each university in settings where a diversity of students was present, including libraries, students unions, and general educational classes. Each university exhibited a wide diversity of size, fields of study, demographics, and social and cultural environment. In both countries students were chosen randomly, nevertheless it is still a convenience sample as the classes were not randomly selected which is a limitation of this study.

As mentioned previously, the data for this study are unique because it is based on behavioral data at the individual level (micro-level) compared to most other studies which are based on country level or macro-level data. The dataset also consists of a large sample of students to ensure adequate representation of student diversity. While surveys have been used in the past to address piracy issues, the difficulty in collecting behavioral data stems from asking individuals about their experiences with piracy. Because some individuals view music file-sharing as a violation of copyright law while others view it as a legitimate activity, careful survey design and anonymity were necessary to minimize false responses.[2] To protect the anonymity of respondents, each survey was assigned a random number to prevent aggregation from a single source. For U.S. students, the survey was paper-based and collected by third-party survey-takers both in class and on campus. Surveys were administered in select general classes as well as in public settings on campus. Because of the risk of data entry error, all data were entered twice and compared for inconsistencies. For the survey undertaken with Swiss students, it first needed to be translated into German. However, because the questions were relatively simple and non-technical, and the author was German speaking, this ensured that both groups were asked the same questions. For Swiss students, the survey was web-based and distributed to students in various classes in classrooms where Internet access was available to every student. Online assistance was available to assist students if necessary. This approach ensured consistency in data collection as well as eliminated data entry risk since the data were extracted directly from the online database. Participation in the survey was completely voluntary, and in some cases students chose not to participate by submitting blank or incomplete surveys. Based on fully completed surveys, the response rate for the paper-based survey was 61%, while the response rate for the web-based survey was 84% due to in-class assistance and motivation of the professor. In order to assess the feasibility and suitability of comparing the offline (paper-based) and online (web-based) survey, we performed a composite reliability and variance extracted analysis. Both show high consistency for both groups. In terms of accuracy we find that the variance-covariance and means matrices are very similar. These results suggest that both surveys can be compared and are comparable.

Following the data collection, the data from the two surveys (one in German, the other in English) were merged, and consistency checks were undertaken to exclude purposely intended outliers. Some data were dropped due to respondent error, and where necessary, variables were adjusted (e.g., currency conversions). A total of 785 completed surveys were collected and analyzed.

[2] For example, we avoided using the terms "illegal" and "piracy" in the survey, and used technical terms like "file-sharing" instead.

5. Empirical framework

The empirical model analyzes the importance of the different categories of factors on the likelihood and extent of music piracy. Consider the following system of censored equations:

$$\begin{aligned} Y_{1i} &= Z_i'\gamma + \varepsilon_1 \\ Y_{2i} &= X_i'\beta + \varepsilon_2 \\ d_i &= I_A\,(Y_{1i} > 0)\quad i=1,2,\ldots,N \end{aligned} \qquad (1)$$

where I_A is a binary indicator function which is 1 if event A is true and 0 otherwise, $d_i = I_A\,(Y_{1i} > 0)$ is a bivariate selection indicator function. Y_{1i} measures the decision to engage in piracy and Y_{2i} accounts for the decision of choosing the extent of the activity. Y_{1i} is not observed but the sign (i.e., d_i) is, whereas Y_{2i} is only observed when Y_{1i} (i.e., d_i) is positive. Moreover, while Y_{1i} captures the sample selection process, indicating whether a randomly selected student engages in music piracy, Y_{2i} is the variable of interest, indicating the extent of the activity. The error terms ε_1 and ε_2 are independent, identically distributed and follow a bivariate normal distribution with mean $E(\varepsilon_1) = E(\varepsilon_2) = 0$, $Var(\varepsilon_1) = 1$, $Var(\varepsilon_2) = \sigma^2$, $Cov(\varepsilon_1, \varepsilon_2) = \sigma_{12}$ and $corr(\varepsilon_1, \varepsilon_2) = \rho$. Under these conditions, it is well known that when $d = 1$ and Y_{2i} are observed, sub-sample OLS estimates of β is biased and inconsistent [Amemiya 1984; Heckman 1976]. Indeed,

$$E[Y_{2i} \mid d_i = 1] = X_i'\beta + E[\varepsilon_{2i} \mid d_i = 1] \qquad = X_i'\beta + \rho\sigma_{12}\,\lambda(Z_i'\gamma) \qquad (2)$$

where $\lambda(Z_i'\gamma) = \dfrac{\phi(Z'\lambda)}{\Phi(Z'\lambda)}$ is the inverse Mill's ratio, and $\phi(.)$ and $\Phi(.)$ are the probability density function and cumulative distribution function of the standard normal distribution, respectively. The maximum likelihood method and the Heckman two-step method are the two popular methods used to estimate β, the coefficients of interest.

We can now analyze music piracy behavior based on the two separate decisions in Equation 1. Defining Y_{1i} as the variable MUSIC, we have MUSIC= $Z_i'\gamma + \varepsilon_1$, where the covariates Z_i is a function of economic, demographic, risk, and cultural factors. Likewise, the dependent variable Y_{2i} is defined in two ways: (i) MUSICALL, the percentage of an individual's entire music collection that consists of pirated music, and (ii) MUSICNEW, the percentage of an individual's music collection obtained within the last six months that consists of pirated music. Both MUSICALL and MUSICNEW are affected by the covariate X which is also a function of the four categories of factors. MUSICALL is a broader variable as it measures a complete history music piracy and to some extent recent actions. On the other hand, MUSICNEW focuses more on how individuals behave today given the current conditions faced, such as greater media coverage of risk factors, the current availability of titles and substitute products, and also the general demand for music which is tied to the quality of the performers and artists.

Finally, given Equation 1, it is likely that X and Z will share the same information because the factors that explain the decision to pirate music are also the same factors that would contribute to the amount of music acquired. The lack of valid exclusion restrictions in estimating Equation 1 is a source of an identification problem which can lead to high collinearity between λ, the inverse Mill's ratio, and the regressors [Vella 1998]. To mitigate this problem, it is necessary to include an additional identifying variable, one that is highly correlated to the propensity of piracy (i.e., entering vector Z of regressors) but not to the extent of piracy (i.e., not entering vector X of regressors). We use SHUT to serve as the additional identifier under the assumption that students that support Internet sites that facilitate music piracy will more likely engage in such activity; however, that variable itself is not sufficient to determine the extent of engaging in the activity.

6. Results

6.1. Summary Results

The summary results are provided in Table 1. Mean values are provided for each variable for three sample groupings: 1) the entire sample, 2) Swiss sample, and 3) U.S. sample. In addition, differences between the Swiss and U.S. samples are provided along with significance t-tests.

Three dependent variables are described. MUSIC is a binary variable indicating whether or not one currently engages in methods to acquire illegal music downloads, while MUSICALL and MUSICNEW measures the percentage of one's total music collection and music obtained in the past six months, respectively, that consist of pirated music. Based on collected data, 58% of U.S. students acquired music via piracy compared to 49% of Swiss students. However, based on the extent of piracy, there is no clear difference as 40% and 38% of music collections among U.S. and Swiss students, respectively, consist of pirated music.

Independent variables are grouped according to the categories described earlier. Economic variables show that American students are less willing to pay for music compared to Swiss students, $0.66 vs. $0.75 per song. This may be reflected by the fact that more Swiss students work compared to American students as well as the

higher average cost of CDs in Switzerland. With respect to the INCOME variable, 35% and 48% of Swiss students worked part-time and full-time, respectively, while 42% and 30% of U.S. students worked part-time and full-time, respectively. In terms of demographic factors, male students comprised 50% of the U.S. sample and 43% of the Swiss sample, while the average age of the U.S. sample is 22.2 compared to 19.3 for the Swiss sample.

Table 1: Summary results

Variables	**All**	**Swiss** (S)	**U.S.** (U)	**Difference ‡** (S-U)
Dependent Variables				
Music	.560	.493	.581	-.088**
Musicall	.397	.383	.401	-.018
Musicnew	.399	.400	.399	.001
Independent Variables				
Economic Variables				
WTP	.681	.746	.662	.085
Income	2.135	2.558	2.015	.543***
Demographic Variables				
Gender	.489	.432	.503	-.071*
Age	21.587	19.315	22.235	-2.921***
Class	2.711	2.322	2.824	-.501***
Risk Variables				
Caught	.148	.199	.133	.066***
Log(Penalty)	5.898	5.336	6.081	-.745***
Warranty	1.973	1.995	1.967	.027
Cultural Variables				
Cheat	1.831	2.278	1.700	.578*
Known	.281	.212	.304	-.091**
Country	.248			
Shut	.228	.164	.248	-.084**

Note: The asterisks *, **, and *** indicate statistical significance at .1, .05 and .01, respectively.

In terms of risk factors, CAUGHT and PENALTY measure the perceived risk of apprehension and perceived fine, respectively, for music piracy. The results show that though Swiss students perceive a higher probability of being apprehended, American students perceive higher penalties if caught. This is perhaps influenced by recent events of enforcement in the U.S and wide media attention as well as the different legal systems where in the U.S. fines are much higher than in Switzerland. While cases of enforcement are relatively few (several thousand out of millions of potential cases), the media attention has illustrated the potential for harsh penalties, which may reflect survey findings.

The cultural related variables show that Swiss students consider cheating (CHEAT) more than American students, and American students are more familiar with cases of copyright enforcement which is consistent with the media attention. A higher percentage of American students (25%) believe programs facilitating piracy should be shut down than Swiss students (16%). Lastly, to test for correlation between independent variables, we include pairwise correlation coefficients of all variables in Appendix 1.

6.2. Regression Results

The empirical results are organized in two parts. We first describe the preliminary probit results, then we analyze the results of the type-2 Tobit model of the pooled and the disaggregated data controlling for Swiss and American students. Overall, probit coefficient estimates shown in Table 2 exhibit the expected signs.

The economic variables INCOME and WTP each exhibit negative and significant coefficients, suggesting that students with greater disposable income and those that perceive greater value with owning legal music files are much less likely to engage in piracy. Further, the significance of WTP is stronger than that of INCOME. One explanation for this is that INCOME may be affected by measurement error because income sources and

school expenses vary significantly among students such that it is not possible to show that students who work necessarily have higher disposable incomes.

In terms of demographic variables, the signs of the coefficients on AGE and GENDER are consistent with our expectations. Males, as the literature suggests, are associated with higher levels of piracy. This finding may reflect two results: male students are more likely to engage in piracy, and further, males are more likely to admit doing so due to lower risk aversion than females. In contrast, such activities tend to decline as the students mature (AGE).

The coefficients of the risk perception variables CAUGHT and PENALTY are negative and significant at the 10% level for CAUGHT but not for PENALTY. The CAUGHT coefficient is relatively bigger in absolute terms suggesting that higher perceptions of being caught tend to reduce piracy, while higher perception of penalties after one is caught has a smaller effect. To account for endogeneity of the risk-perception variables, CAUGHT and PENALTY are replaced in Column 2 by the instrumental variable WARRANTY, which appears insignificant in explaining piracy. This provides evidence that our original risk perceptions variables are likely influenced by other factors such as cultural upbringing.

Lastly, we turn to the cultural related variables. The coefficient of the variable CHEAT is positive and highly significant. CHEAT is a strong indicator of personal cultural behavior (as well as to some extent risk preference) and is influenced mostly by social groups surrounding the person since childhood. On the other hand, KNOWN, which measures a reaction to information acquired either via the knowledge of the law or learned from recent enforcement is insignificant.[3] The effect of the cultural variable SHUT is negative and highly significant providing insight that morals can temper the propensity to engage in criminal activity such as copyright piracy. Finally, the effect of the variable COUNTRY is negative and strongly significant indicating that Swiss students are less likely to engage in music piracy than American students.

Table 2: Probit estimates of the determinants of music collection consisting of pirated music

	(1)	**(2)**
Economic Variables		
WTP	-.169***	-.157***
Income	-0.155*	-.215*
Demographic Variables		
Gender	.247***	.253***
Age	-.046***	-.039***
Risk Variables		
Caught	-.362*	
Log(penalty)	-.032	
Warranty		-.024
Cultural Variables		
Cheat		.208***
Known		.320
Country	-.310***	-.401***
Shut	-.340***	-.410***
Constant	1.359***	1.755***
Log-likelihood	-451.64	-489.28
Observations	710	777

Note: The asterisks *, **, and *** indicate statistical significance at .1, .05 and .01, respectively.

The direction of the relationships of the preliminary results is further analyzed in the context of the type-2 Tobit model that focuses primarily on the extent of music piracy. We base our type-2 Tobit estimation results on

[3] We test the joint significance of the three instrumental variables using the likelihood ratio test. The test statistic is $2[\ell(\theta^U)- \ell(\theta^R)] \sim \chi^2(r)$ where ℓ denotes the likelihood function evaluated at unrestricted (U) and restricted (R) parameter values and r is the number of restrictions. The unrestricted model (Equations 2 and 4 in Table 3) is compared with the restricted model, which we do not report. This yields test statistic values of 19.46 and 20.18 for MUSICALL and MUSICNEW equations, respectively. We compare these values with 11.34, the critical χ^2 value with 3 degrees of freedom at the 1% level of significance. We hence reject the null hypothesis that the three instruments are not jointly significant.

the maximum likelihood method, which is more efficient than the two-stage Heckman procedure [Davidson and MacKinnon 1993; Maddala 1983]. Table 3 presents the regression results by using two equations based on MUSICALL and MUSICNEW (defined earlier) as the dependent variables. Regression estimates mostly exhibit expected signs and they follow the same pattern as in the probit results.

Table 3: Maximum Likelihood estimates of the extent of total music collection consisting of pirated music

	MUSICALL		**MUSICNEW**	
	(1)	**(2)**	**(3)**	**(4)**
Economic Variables				
WTP	-.045***	-.046***	-.049***	-.049***
Income	-.014*	-.027*	-.073*	-.026*
Demographic Variables				
Gender	.061**	.058**	.081**	.080**
Age	-.021***	-.020***	-.019***	-.019***
Risk Variables				
Caught	-.023**		-.087	
Log(penalty)	-.008		-.007	
Warranty		-.004		-.015
Cultural Variables				
Cheat		.059***		.055***
Known		-.024		.053
Country	-.047*	-.068*	-.020	-.069
Constant	.941***	1.053***	.808***	1.009***
Log-likelihood	-462.56	-471.28	-468.44	-499.66
Sigma	.418	.416	.467	.443
Observations	713	782	716	782

Note: The asterisks *, **, and *** indicate statistical significance at .1, .05 and .01, respectively.

The coefficients of the risk variables, CAUGHT and PENALTY, remain negative as expected; while PENALTY is not significant, the instrumental variable CHEAT is shown to be a factor contributing strongly to music piracy. In the same vein, higher willingness-to-pay (WTP) and INCOME reduces the magnitude of piracy. Moreover, male and younger students tend to have larger collections of pirated music. Finally, American students on average possess a larger share of pirated music than their Swiss counterparts as indicated by the negative and significant coefficient for COUNTRY in estimating MUSICALL. Specifically, the mean for MUSICALL was 38% for Swiss and 40% for American students. However, COUNTRY becomes insignificant when estimating MUSICNEW. An explanation for this is that American students may have had earlier exposure to file-sharing programs, which then corresponds to a larger overall collection of pirated music. But when focusing on recently acquired music, the difference between American and Swiss students is negligible as indicated by the mean of MUSICNEW, which is virtually identical (40%) for all students.

7. Policy discussion

Despite differences in national culture, content providers worldwide share common objectives, namely (1) commercialization of digital content to the widest market possible and 2) fighting piracy that subsequently ensues throughout the global marketplace. A number of strategies are taken by content providers to balance these objectives.

The first strategy is technology driven. By using Digital Rights Management Systems, this increases the likelihood to track and detect copyright violations of digital music and hence increase consumer's perceived probability of being caught. Another solution is to use so-called anti-piracy companies, such as BayTSP, Audible Magic, or Overpeer, which flood peer-to-peer networks with corrupted files making illegal downloading more frustrating for consumers and hence reduce the utility of the illegal copy.

The second strategy is dominated by legal actions, meaning that content providers use existing laws such as the Digital Millennium Copyright Act (DMCA) to prosecute users for copyright violations. This is a worldwide effort; for example, in Canada and Europe, the IFPI has taken legal actions against individuals sharing music

files. In addition, content providers and policy makers can propose new bills, such as the pending Piracy Deterrence and Education Act, which would enhance criminal enforcement of copyright laws and educate the public about the application of copyright law to the Internet.

The third strategy is the improvement of business models, with content providers developing attractive offerings to consumers in the legal market that "compete" against the illegal offerings. An example is super-distribution, which allows not only the cross-selling of music but also complementary products. In 2005 Vodafone launched a music service in the UK and Japan, enabling super-distribution between users' handsets by using the DRMS from CoreMedia, based on the first open standard from the industry's organization Open Mobile Alliance (OMA). Another innovation launched by entertainment and broadband service providers are music vending machines in the UK that allow users to purchase and download songs in public areas such as pubs and railway stations. These kiosks allow users to purchase downloads for mobile phones or MP3 players for about one Pound (US$2.00) per song.

8. Conclusions

Using a conceptual model of piracy, this paper identified four categories of factors: economic, demographic, risk, and culture, that are hypothesized to influence consumer behavior with respect to music piracy. A particular emphasis was placed on the importance of cultural and risk aspect in music piracy. Our findings are consistent with existing empirical literature for the economic, demographic, and risk factors. In particular, economic variables such as income and willingness to pay reduce the propensity to engage in music piracy. With respect to the demographic factors, male students are more prone to piracy, whereas older students are less likely to engage in such activity. Finally, the key risk variables probability of getting caught when conducting such illegal activity and the resulting penalty to be paid are negatively associated with music piracy behavior.

Importantly, a number of findings emerge from our cultural variables. Students even from similar western countries with some cultural differences view and treat copyright differently, which ultimately affects the propensity to engage in piracy. Indeed, our results show that consumer behavior can differ even among developed and technologically advanced countries such as the United States and Switzerland. For example, compared to Swiss students, American students are more likely to engage in music piracy, though this gap is narrowing. Tailored policies can therefore be used to alleviate piracy behavior in each country. For example, in the U.S. emphasis can be placed on increasing the perception of being caught and prosecuted for piracy, while in Switzerland emphasis can be placed on increasing the moral sentiment of why file-sharing services should be reduced or shut down.

Because of the paper's limitations stemming from the convenience sample, available data, and the fact that we have used proxies for some of those variables, further research is needed to explore that issue more. We encourage scholars to also assess the underlying costs of risk and network externalities associated with piracy, including opportunity costs and the risk of computer viruses and spyware. In addition, other consumer groups and countries would be valuable, though difficult given the task of administering surveys across cultures and languages. This would offer a fruitful avenue for future research on this important issue that affects not only the content industry, but universities, governments, and policy makers.

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APPENDIX 1: Correlation coefficients matrix

	Musicall	*Musicnew*	*WTP*	*Income*	*Age*	*Gender*	*Class*	*Caught*	*Penalty*	*Cheat*	*Shut*	*Known*	*Country*
Musicall	1												
Musicnew	.82**	1											
WTP	-.23**	-.21**	1										
Income	-.17**	-.17**	.16**	1									
Age	-.17**	-.17**	.07	-.04	1								
Gender	.22**	.27**	-.12**	-.09*	.06	1							
Class	-.09*	-.10*	.04	.06	.47**	.07	1						
Caught	-.11*	-.10*	.08	.16**	-.17**	-.17**	-.07	1					
Penalty	-.02	.02	-.01	-.01	.04	.10*	.08	-.01	1				
Cheat	.10*	.12**	.02	.07	-.20**	.05	-.05	.01	-.06	1			
Shut	-.22**	-.19**	.18**	-.02	.20**	-.09*	.12**	.03	.08	-.11*	1		
Known	.05	.09*	-.04	-.04	.01	.09*	.00	.01	.15**	.08	-.01	1	
Country	-.07	-.04	.06	.37**	-.41**	-.05	-.19**	.19**	.00	.46**	-.08	-.07	1

Note: * and ** indicate that the correlation is significant at the 0.05 level (2-tailed) and 0.01 level (2-tailed), respectively.

Definition of variables:

- *MUSIC*: 1 if a student engages in music piracy and 0 if the student does not
- *MUSICALL*: Percentage of total music collection consisting of pirated music
- *MUSICNEW*: Percentage of new music (obtained last 6 months) consisting of pirated music
- *CAUGHT:* Perceived probability of being caught or sued for copyright piracy (0 to 100)
- *PENALTY:* Perceived fine to be paid if found guilty of copyright piracy (in $US thousands)
- *WARRANTY*: Frequency of purchasing extended warranties on major purchases when offered
- *WTP*: Willingness-to-pay per legally downloaded song (in $US)
- *INCOME*: Whether a student works full-time (= 3), part-time (= 2), or not at all (= 1).
- *GENDER*: 1 if male and 0 if female
- *AGE*: Age of student (in years)
- *CLASS*: First-year = 1 to grad student = 5
- *CHEAT*: Whether one considers cheating when taking an exam (4 = always to 1 = never)
- *KNOWN*: Knowledge of cases of apprehension for copyright violations (1 = yes and 0 = no)
- *COUNTRY*: Country of residence (1 = Switzerland and 0 = U.S.)
- *SHUT*: Whether Internet sites facilitating music piracy should be shut down (1 = yes and 0 = no)