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Internet Scallywags: A Comparative Analysis of Multiple Forms and Measurements of Digital Piracy

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Abstract: *Internet-based digital piracy has recently become a widespread occurrence. Despite this growth, few studies have attempted to apply criminological theory to the crime. This study tests the explanatory power of two criminological theories, general deterrence and differential association, on Internet piracy of music, software and movies. Data used in this study were collected from 541 undergraduate college students from a mid-Atlantic university. Separate models were estimated for willingness to and involvement in digital piracy. The results show that variables derived from differential association theory, such as peer activity and parental support, as well as several control variables including gender, connection speed, income, and place of residence, are predictive of digital piracy. Distinctions between willingness and actual involvement are discussed. Implications for future research and potentially more effective prevention strategies are also addressed.*

Keywords: differential association; social learning; deterrence; digital piracy; cybercrime

In recent years, copyright violations in the form of digital piracy have increased dramatically. This has been especially true since peer-to-peer (P2P) programs became popularized in 1999. One study found that the United States, despite having a relatively low and stable rate of piracy, experienced a loss of over $6.8 billion in 2005 from software piracy alone (Business Software Alliance 2006). Music piracy is also quite prevalent with more than 27 billion media files transferred each year through P2P programs (House of Representatives 2004). Studies of changing piracy rates indicate several benefits from decreasing the prevalence of piracy. For example, a decrease by ten points in the piracy rate of the United States could add over 100,000 new jobs and increase tax revenue by $21 billion (IDC 2005). Despite the widespread occurrence and great financial impact of digital piracy, however, very few empirical studies have systematically assessed factors related to digital piracy.

The primary purpose of this study is to test the explanatory power of two criminological theories, general deterrence and differential association, on digital piracy of music, software and movies. This study theoretically and methodologically advances research on digital piracy in several related areas. First, while measures of general deterrence and differential association theories have been previously examined in a handful of studies (e.g., Higgins and Makin 2004a; Skinner and Fream 1997), prior research has been limited in the types of piracy assessed. Online music piracy, for example, has only rarely been included in tests of criminological theories (e.g., Hinduja 2006). It is thus unclear whether findings from previous research can be applied to all variations of piracy or only the specific type investigated.

Second, only a small number of control variables have been considered in previous research. This study takes into account the effects of ten relevant variables, several of which, such as income and place of residence, have not been included in prior research of digital piracy. Finally, prior studies have used involvement in piracy and willingness to pirate interchangeably. This study conceptually distinguishes the former from the latter and empirically tests both under separate models to produce comparable results, thus enhancing our understanding of factors that lead to digital piracy and offering valuable implications for policy makers and practitioners.

THEORIES OF AND RESEARCH ON DIGITAL PIRACY

In the broadest of terms, digital piracy is the act of duplicating digital files without the permission of the copyright holder. More specifically, piracy is typically considered any act of reproducing a copyrighted work in violation of U.S. copyright law (Copyright Act of 1976). *Digital* piracy, by extension, is a specific variant of this broad category involving computers as a means to commit the act and generally includes music, software, and movie infringements, though other forms exist such as reproductions of books. Though many criminological theories could be applied to digital piracy, this study specifically focuses on two: differential association and general deterrence. Elements of these theories have been assumed to be relevant to piracy by popular literature and government reports (e.g., House of Representatives 2004) and have been empirically tested in previous studies of digital piracy (e.g., Higgins and Makin 2004a; Skinner and Fream 1997). Though these theories have received much attention in empirical studies of crime in general, it is unclear whether tests of traditional street crime are applicable to digital crimes. Some authors have considered digital piracy a form of white collar crime (e.g., Higgins and Wilson 2006), yet many definitions of white collar crime are restrictive enough to exclude it. Sutherland's (1940:1) definition, for example, defines white collar crime as "crime in the upper or white-collar class, composed of respectable or at least respected business and professional men…" Though later research has noted that such respectability can be faked (Shapiro 1990), respectability or the appearance thereof remains an integral part of white collar crime. Online piracy, which involves only a computer and minimal technical ability, requires no such respectability. Therefore, digital piracy can be considered a unique crime in that it is neither traditional street crime nor white collar crime. As such, the applicability of criminological theories remains questionable. Though recent studies of digital piracy (e.g., Higgins and Wilson 2006; Higgins, Wilson, and Fell 2005; Hinduja 2006; Skinner and Fream 1997) have provided empirical tests of various criminological theories, there is still much progress to be made in this aspect of digital piracy.

Differential Association

One of the first social learning theories used to specifically explain crime, differential association (Sutherland and Cressey 1960/2003), views crime as the result of social interaction. According to the theory, an individual is only able to commit a crime after being exposed to an excess of definitions favorable to the violation of law. These definitions include the motives, attitudes, and techniques supportive of crime. The most powerful definitions come from intimate primary groups, such as family and peers. Secondary groups, such as schools and government officials, transmit less powerful definitions. The theory has received various revisions throughout the years since its inception (Akers 1985; Burgess and Akers 1966), yet the concept of differential association has remained one of the main posits of the theory even in the most recent reformulations (Akers 1998). Moreover, it has received strong support empirically as applied to more traditional crimes (e.g., Hoffman 2003; Matsueda 1982; Orcutt 1987) and, in summarizing the empirical support for the theory, it was stated by Mark Warr that there is "no... better predictor of criminal behavior than the number of delinquent friends an individual has" (Warr 2001:186).

Applying the theory to the explanation of piracy, the theory predicts that individuals learn how to engage in piracy and moral justification for piracy primarily from friends and family. Not only might peers introduce the idea of downloading without cost, an act that is obviously not advertised, they may also share various neutralizations for the theft. In fact, interviews and focus groups have shown that digital pirates hold many beliefs about the ethics of their behavior and find solidarity with other pirates sharing these beliefs (Gantz and Rochester 2005). It is quite likely that these justifications and neutralizations are transmitted through the process of differential association.

The empirical evidence for using differential association indicates that the theory holds promise as an explanation for involvement in piracy. Previous studies applying differential association to digital piracy have focused predominately on the effect of peer involvement in piracy and found that high levels of peer involvement led to more frequent engagement in piracy (Limayem, Khalifa, and Chin 1999; Higgins 2005; Higgins, Fell, and Wilson 2006; Higgins and Makin 2004a; Higgins and Makin 2004b; Higgins and Wilson 2006; Hinduja 2006; Skinner and Fream 1997). Though less research attention has been paid to the influence of family on piracy, findings tend to support this link as well (Skinner and Fream 1997). These studies have primarily focused on software piracy and, to a lesser extent, movie piracy. With only the occasional exception (e.g., Hinduja 2006), criminological research has largely ignored the more prevalent crime of music piracy.

General Deterrence

The theory of general deterrence dates back to the work of Cesare Beccaria in the 1760s (Beccaria 1764/1985). The original theory applied to the general populace as a whole and predicted that increases in the severity, certainty, and celerity of punishment would cause crime rates to decrease, as people would not choose to commit crimes if they believe punishment is immediate, certain, and severe. More recent works (e.g., Clarke and Cornish 2001) have applied this theory to individuals and

acknowledged that not everyone shares the same experience and knowledge. Therefore, it is each person's individual perception of punishment that can serve as an inhibitor if he or she believes punishment to be likely and severe. In its application to traditional street crimes, general deterrence has received moderate empirical support (e.g., Paternoster 1988). Though punishment severity has received mixed support, perception of punishment certainty is typically a significant predictor of crime, which is actually consistent with Beccaria's prediction that certainty is the more important element (1764/1985). Moreover, general deterrence has been successfully applied to non-traditional crimes, such as tax evasion and noncompliance (Klepper and Nagin 1989).

Specific to piracy, a combined general deterrence and rational choice perspective would predict that individuals engage in piracy because of the potential benefit of gaining the copyrighted works without a financial cost. If the potential loss due to a threat of punishment outweighs the potential gain, an individual is considerably less likely to engage in such an action. Thus, an individual is less likely to engage in piracy if he or she perceives that the repercussion for piracy, whether by government authorities or by actions through civil law, outweighs the benefits in the illegal act. Interestingly, general deterrence has received mixed support in recent empirical studies of digital piracy. Qualitatively, it is quite clear that statements by pirating individuals on the topic of punishment are consistent with deterrence. Specifically, the pirates interviewed reported very little fear of prosecution, believing that "prosecution is extremely uncommon, and the most severe penalty… is deactivation of Internet access" (Cooper and Harrison 2001:87). Conversely, quantitative studies (Higgins et al. 2005; Skinner and Fream 1997) have found only weak or non-significant effects by punishment on piracy. It is quite possible that these reported differences in findings are actually describing the same conclusion; both pirates and non-pirates seem to agree that prosecution is unlikely. As with empirical studies of differential association, the quantitative studies (Higgins et al. 2005; Skinner and Fream 1997) of deterrence have focused almost exclusively on software piracy, unlike the audio piracy discussed in the qualitative study (Cooper and Harrison 2001).

Statistical Control

Despite statistical controls being commonplace in regression analyses, few of the existing studies of digital piracy include multiple statistical controls. The most frequently used control variable in statistical studies of piracy is gender. One of the earliest studies of digital piracy (Skinner and Fream 1997) found gender to be a significant predictor of software piracy with males more likely to engage in the illegal act. The evidence of gender as an important control variable is mixed among recent research. Two recent studies investigating software piracy found gender to be a non-significant predictor (Higgins and Makin 2004a; 2004b), while a third found gender to be a strong predictor of intentions to pirate software with males once again more likely to pirate (Higgins et al. 2005). For music piracy, gender significantly predicts involvement in illegal downloading, also with males having a greater likelihood of pirating (Hinduja 2006). Age has also occasionally been used for control purposes in statistical analyses of digital piracy. Studies using age as a control variable found that age is not predictive of piracy in regression analyses (Higgins and Makin 2004a; Higgins and Makin 2004b; Higgins et al. 2005), with only one exception in a study of music piracy that found older college students less involved in piracy (Hinduja 2006). Unfortunately, with regard to these demographic variables, these studies do not present a theoretical explanation for their relationship to piracy and simply interpret the direction and significance of the coefficients without explaining the relationship. Hohn, Muftić and Wolf (2006) speculate that these relationships may be similar in nature to other crimes, such as an aging out effect to explain the age relationship. They also suggest that the gender gap is smaller than normally seen in crime research, as piracy is considered a minor crime by the general population, and minor crimes typically have smaller gender differences in prevalence rates (Smith and Visher 1980).

Other, less commonly used, control variables have included race, major of study, and technical ability. An initial study involving race indicated that Asian students had a higher likelihood of engaging in software piracy according to bivariate analyses (Hinduja 2003). Ethnicity as a dichotomous variable, however, was found to be non-significant in predicting piracy when used in multivariate analyses (Higgins et al. 2005; Hinduja 2006). Technical ability has also been previously tested and found to be a non-significant predictor of software piracy (Higgins and Makin 2004b; Higgins and Wilson 2006). Both of these studies, however, adapted the measure from a computer use scale (Igbaria and Chakrabarti 1990) developed nine years prior to the P2P popularity of the late 1990s. Participants were asked how often they used software such as a word processor, the Internet, and email with possible responses of never, sometimes, often, and a lot. With all of these activities commonplace among college students, the population under study, it is not surprising that the measure was not a significant predictor of piracy. Finally, a single study including major of study by Hinduja (2003) noted that students majoring in business or social sciences are less likely to engage in piracy based on several measures of software piracy.

There are several additional potential control variables that have not been previously included in piracy research. First, because piracy is a form of theft, a measure of financial wealth may be of importance. Those with less disposable income may be more inclined to take the free, if

illegal, path of downloading files without paying the cost. To be sure, focus groups have indicated that the high cost of music CDs, or more precisely the high financial cost perceived by college students, is a driving force toward piracy (Gantz and Rochester 2005) and those with greater disposable income may be less likely to resort to illegally avoiding market prices. Similarly, having a broadband (high speed) connection has not previously been used as a control variable despite its face validity as a predictor of piracy given the reduction in time required to download files illegally. For example, the time to commit a single act of music piracy is reduced from 11 minutes per song to less than one minute when a broadband connection such as those offered by universities is present (Cooper and Harrison 2001).

One other variable, residing on-campus, has also not been previously addressed by piracy literature despite the college experience having long been associated with piracy (e.g., Im and Koen 1990) and college dormitories being part of that experience for many students. Thus, based on a social learning theory, the increased exposure to an environment in which piracy is common would be expected to increase involvement with the crime. Conversely, these institutions are attempting to decrease piracy through enforcement mechanisms and anti-piracy education and information, often in response to or anticipation of legislation or lawsuits mandating such enforcement (e.g., College Opportunity and Affordability Act of 2007). Thus, though the direction if any is unclear, residing on-campus may have ramifications on pirating behaviors.

Willingness and Involvement

In studying digital piracy, there appears to be two distinct categories of ways to measure piracy. The first category relates to actual violations of copyright law. For example, Skinner and Fream (1997) asked participants whether they ever used, made, or gave an illegal copy of software. Similarly, Hinduja (2001; 2003; 2006) also asked directly about the number of piracy related infractions within a given period of time. Conversely, most other studies tend to measure piracy in the form of the respondent's willingness to pirate. One study (Shore et al. 2001), for example, developed nine ethical scenarios and asked participants, using a Likert-like scale, whether they would do the described act. Higgins and colleagues (Higgins and Makin 2004a; Higgins and Makin 2004b; Higgins et al. 2005) have also utilized several of these scenarios in their research of piracy.

The reasons for such a divide are not altogether clear. Shore and colleagues justify the method by stating, “Scenarios provide opportunities to obtain a response to a controlled situation that is constant across all subjects” (Shore et al. 2001:570). Their study, however, was exclusively interested in comparing beliefs about piracy among different cultures. Is the effectiveness of scenarios similar when using willingness as a proxy for involvement? Higgins and colleagues similarly endorse a likelihood measure stating that the scenario provides “opportunity equal for all of the students in the study” (Higgins and Makin 2004a:22). Yet, their study clearly discusses the findings in terms of effects on actual software piracy. Does equalizing opportunity among participants in some way bias or alter the results? A later study furthers the justification for using willingness as a proxy by stating that likelihood “captures an individual's intentions or readiness to perform a behaviour, which some have considered a proxy for actual behaviour” (Higgins and Wilson 2006:81). If intentions are to be used as a proxy, why, then, not simply measure the behavior rather than the proxy?

There are several potential reasons for using proxies rather than the actual behavior of study not discussed by the piracy literature. Involvement in crime is obviously a delicate issue, and there is potential for that to bias responses. Even with anonymity guaranteed, participants may be reluctant to divulge deviant behavior. Additionally, more pragmatic reasons (e.g., an institutional review board) may prevent questions directly addressing involvement in crimes. Essentially, there may very well be justification for using a proxy such as willingness, but the validity of such measures is undocumented in relation to modern digital piracy.

Present Study

This study seeks to answers three main questions. First, are measures derived from differential association and deterrence theory predictive of piracy behaviors, and are these effects uniform across multiple forms of piracy? Prior studies (e.g., Higgins and Makin 2004a; Skinner and Fream 1997) have shown strong support for differential association and only weak support for deterrence. However, most of this prior research has exclusively studied software piracy. Will similar results be found when investigating distinctive types of piracy? In other words, this study will attempt to determine the degree to which conclusions reached about one form of piracy (e.g., software) can be extended to another (e.g., music).

Second, have significant control variables been overlooked by prior research? Theory testing studies of piracy have typically been limited to two or three control variables at most. Would including additional control variables, such as broadband Internet access and personal income, alter the significance of effects of theoretical variables? Finally, are willingness to pirate and involvement in piracy influenced by similar or different factors? Using likelihood variables as a proxy for actual behavior seems commonplace in piracy literature, but an empirical comparison of the two piracy measures to assess their interchangeability has not been attempted.

METHODS

Data Collection and Sample

Prior research has postulated that perceptions of punishment can best be ascertained through vignettes describing the criminal act being studied (e.g., Bachman, Paternoster, and Ward 1992; Klepper and Nagin 1989). Therefore, participants were presented with three vignettes each describing an individual committing a specific act of piracy.[1] Several questions followed each vignette and addressed the likelihood of punishment, severity of punishment, similarity to peer behavior, technical ability to engage in the act, and parental support for such behavior. To minimize confusion between piracy and legal downloading, participants were explicitly told prior to responding that the scenarios and questions in the questionnaire are not instances of legal downloading (e.g., iTunes, shareware, demos, etc.).

Prior research has found that piracy rates are especially high among college student populations, and a decline in music sales has been linked to areas with college campuses (Deloitte LLP 2004). Moreover, it has been suggested that this may be related to the most common types of piracy (music, movies, and software) being popular in college settings, as well as the technological ability and access present in the setting (Hohn et al. 2006). Thus, though a college sample would limit generalizability, studying data from college students may be more appropriate given their unique environment and characteristics. As such, data used in this study were collected through survey questionnaires from undergraduate students in a mid-Atlantic, moderately sized, public university. The sample was a nonrandom sample of 548 undergraduates enrolled and present on the day of administration in one of eleven selected courses during the spring 2006 semester. The courses were selected based on their varying enrollment size, level, and topic. Seven students opted not to partake in the study, and 28 submitted incomplete questionnaires. Thus, the final sample had 513 participants and a response rate of approximately 94 percent.

The demographics of the sample are displayed in Table 1. Gender, race, and class year appear to be roughly representative of the institution from which the sample was drawn. Official statistics about the population from which the sample was drawn are provided next to the sample demographics in Table 1. With regard to the chosen majors of study of the participants, the sample is over

Table 1. Sample Demographics

Variables	Percent	N	Population Percent
Gender			
Male	43.7	224	42.2
Female	56.3	289	57.8
Race/Ethnicity			
White	86.5	444	84.4
Black	5.1	26	5.6
Hispanic	4.1	21	4.1
Asian	2.5	13	3.5
Other/Mixed	1.8	9	2.4
Class Year			
Freshman	32.7	168	28.8
Sophomore	26.1	134	25.1
Junior	18.3	94	23.0
Senior	22.6	116	23.2
Graduate/Other	0.2	1	
Major			
Business-related	13.6	70	
Computer Sciences	0.8	4	
Criminal Justice	22.6	116	
Natural Sciences	8.6	44	
Psychology	8.6	44	
Sociology	6.6	34	
Other Social Science	10.1	52	
Other	29.1	149	

representative of the social sciences and under representative of the computer sciences, though specific population statistics for major of study were unavailable.

Variables

Six dependent variables are used for this study. The first three of these variables measure the participants' involvement in piracy. Participants were asked how often they downloaded files without paying for them. For music piracy, responses included: (1) never, (2) 1-5 songs per month, (3) 6-15 songs per month, and (4) more than 15 songs per month. For movie piracy, responses included: (1) never, (2) 1-3 movies per month, (3) 4-6 movies per month, and (4) more than 7 movies per month. Finally, for software piracy, responses included: (1) never, (2) 1-3 programs per *year* , (3) 4-6 programs per *year* , and (4) more than 7 programs per *year*.[2] The second set of three dependent variables measures participants' willingness to pirate. In response to three vignettes describing the illegal downloading of music, software, and movies, participants were asked how likely it is that they would do the described act. Response categories included: (1) extremely unlikely, (2) unlikely, (3) likely, and (4) extremely likely.

The analysis also includes four main independent variables. Each of these was measured three times, once for each vignette. Two variables, peer activity and parental support, were constructed to measure differential association. Drawing upon the work of Skinner and Fream (1997), peer activity was measured by asking how many of the respondent's friends would do the described act (e.g., downloading music without paying for it). Responses included: (1) none, (2) few, (3) about half, or (4) most or all. Parental approval was measured by asking if the respondent's parents would approve if they did the act illustrated in the vignette. The possible responses ranged from (1) strongly disapprove to (4) strongly approve.

Table 2. *Descriptive Statistics*

Variables	Mean	SD	Min	Max
Dependent Variables				
Piracy Involvement				
Music	2.48	0.593	1	4
Software	1.41	0.691	1	4
Movies	1.22	0.593	1	4
Piracy Willingness				
Music	3.04	0.903	1	4
Software	2.42	0.935	1	4
Movies	2.34	0.925	1	4
Independent Variables				
Peer Activity	3.66	0.630	1	4
	2.68	0.949	1	4
	2.80	0.897	1	4
Parental Support	2.55	0.697	1	4
	2.38	0.746	1	4
	2.36	0.745	1	4
Punishment Certainty	1.91	0.627	1	4
	2.10	0.699	1	4
	2.12	0.694	1	4
Punishment Severity	0.56	0.497	0	1
	0.63	0.483	0	1
	0.65	0.476	0	1
Control Variables				
Gender (0 = Females)	0.44	0.359	0	1
Race (0 = Non-White)	0.87	0.342	0	1
Class Year	2.31	1.156	1	4
Parental Income	4.12	1.056	1	5
Personal Income	3.21	1.144	1	6
Business Major	0.14	0.344	0	1
Social Science Major	0.48	0.500	0	1
Technical Ability	0.95	0.224	0	1
	0.74	0.441	0	1
	0.83	0.379	0	1
Broadband Internet	0.94	0.239	0	1
Residing On-Campus	0.59	0.493	0	1

Two common deterrence variables, punishment certainty and punishment severity, were also measured using the vignettes. Based on the work of Skinner and Fream (1997), punishment certainty was measured by asking how likely it was that the described act would result in the individual being "caught and punished," with responses ranging from (1) extremely unlikely to (4) extremely likely. Punishment severity was also constructed using a single item that asked participants about what the punishment would be if "caught." The original response categories described different categories of punishment identified by prior research (e.g., Cooper and Harrison 2001) and included: nothing, small fine, loss of Internet access, heavy fines/lawsuit, or jail/prison. The responses were collapsed to (0) not severe for responses of nothing, small fine or loss of Internet access and (1) severe for heavy fines/lawsuit or jail/prison.[3] Ten control variables were selected for this study. Gender, race, technical ability, access to broadband speed Internet access, and residence are dichotomous variables with 1 representing male, non-white, having technical ability, having broadband speed Internet access, and residing on campus. Students' majors are divided in three groups for the analysis: business major, social science major, and non-business, non-social science major. The first two groups are the most common majors among participants and also represent areas previously linked to a decreased involvement in piracy (Hinduja 2003). Dummy variables were created to represent these groups, and the last group (non-business and non-social science) is treated as the comparison group in the analysis.

Other control variables, including class year, parental income, and personal income, were constructed as either categorical or ordinal variables. Class year is a categorical variable: (1) freshman, (2) sophomore, (3) junior, and (4) senior. Though class year has not been included in prior studies per se, it may serve as a proxy for age, which has been addressed previously (e.g., Higgins et al. 2005). Parental income (per year) was measured with the following responses: (1) under $25,000, (2) $25,000 to $39,999, (3) $40,000 to $64,999, (4) $65,000 to $84,999, and (5) $90,000 or greater. Similarly, personal income (per year) was measured with responses including (1) under $200, (2) $200 to $999, (3) $1,000 to $3,999, (4) $4,000 to $7,999, (5) $8,000 to $14,999, and (6) $15,000 or greater.[4] The descriptive statistics for all variables are displayed in Table 2. The correlations among explanatory variables were examined. None of the correlation coefficients exceed .56, suggesting that collinearity is not a concern.

Analysis

To determine the effect of each variable on piracy, 12 ordinal logistic regression analyses are performed. The data analysis involves two steps. First, only the four theoretically driven variables (i.e., peer involvement, parental support, punishment certainty, punishment severity) are entered (into the A models) as predictors of actual piracy activity. This allows an independent assessment of the explanatory power of theoretically related variables. Second, the ten control variables are added (into the B models) and the results compared to the first model. This will determine if the addition of the control variables alters the significance of any relationships. The two steps are then repeated, but with piracy willingness as the dependent variable instead of piracy activity.

The results from these models will be used to determine findings in two key areas. First, the results from models predicting piracy involvement will be used to determine whether the introduction of additional control variables potentially related to digital piracy alters the significance of any theoretically driven variables. Second, results from models predicting piracy willingness will be compared to the previous models predicting involvement. Because the models being compared contain identical independent variables and data, the results should be identical or quite similar if willingness serves as a proxy for involvement as previously implicated (Higgins and Wilson 2006). In cases such as this, simply comparing the statistical significance of variables is not sufficient, as doing so would not indicate if one coefficient is significantly higher or lower than its counterpart. Thus, the test of regression coefficient equality (Paternoster et al. 1998) will be used to determine if any coefficients significantly increase or decrease after changing the dependent variable to willingness.

RESULTS

The results of the ordinal logistic regressions for piracy involvement are presented in Table 3. Looking at Models 1A, 2A and 3A first, both measures of differential association, peer activity and parental support, appear to be significant predictors of all three types of piracy. Specifically, students who have more friends involved in music, software and movie privacy and who have strong parental support for such behavior are significantly more likely to engage in piracy. These findings are consistent with the results from prior research that incorporated differential association variables (e.g., Higgins and Makin 2004a; Skinner and Fream 1997). Although differential association variables exert a consistent and significant impact on piracy, deterrence variables are much less predictive of piracy. Punishment severity is not a significant predictor in all three models, and punishment certainty is a significant predictor in only one of the three models (i.e., model 2A). Students who perceive punishment to be likely are less engaged in software piracy. A prior study of software piracy also noted this significant relationship (Higgins et al. 2005). The four independent variables together account for 11.6 percent of the variance in music privacy, 27.3 percent of the variance

in software piracy, and 13.7 percent of the variance in movie piracy.

Models 1B, 2B and 3B in Table 3 represent the result of the regressions of piracy involvement with the control variables entered into the analyses. The results are nearly identical to the previous models with regard to peer and parental influence. There are some small fluctuations in the coefficients, but overall the differential association variables remain as significant predictors in all three models. Noteworthy, however, is the change in the relationship between punishment certainty and software piracy. The significant effect of punishment certainty on software piracy disappears (model 2B), suggesting that significant impact of punishment certainty may be spurious. A new significant connection emerges in model 3B. Punishment certainty becomes a significant predictor of movie piracy. Contrary to deterrence theory, however, students who believe punishment is certain are more likely to engage in movie piracy.

***Table 3**. Ordinal Logistic Regression Results for Piracy Involvement*

Variables	Music		Software		Movies	
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Independent Variables						
Peer Activity	.81***	.62***	.80***	.77***	.71***	.80***
	(-.14)	(-.15)	(-.12)	(-.14)	(-.17)	(-.18)
Parental Support	.45***	.51***	.56***	.67***	.71***	.84***
	(-.12)	(-.13)	(-.16)	(-.17)	(-.19)	(-.21)
Punishment Certainty	.01	.19	-.57***	-.29	.19	.47**
	(-.13)	(-.15)	(-.18)	(-.19)	(-.20)	(-.21)
Punishment Severity	.14	.20	.18	.37	-.01	.22
	(-.16)	(-.17)	(-.22)	(-.24)	(-.26)	(-.29)
Control Variables						
Gender (0 = Female)		.52***		.94***		1.67***
		(-.18)		(-.23)		(-.31)
Race (0 = Non-White)		-.49**		-.28		-.81**
		(-.25)		(-.32)		(-.36)
Class Year		-.15*		.09		.26*
		(-.09)		(-.12)		(-.15)
Parental Income		.04		.10		.13
		(-.08)		(-.11)		(-.14)
Personal Income		.07		.20***		.23*
		(-.07)		(-.10)		(-.12)
Business Major		-.15		-.73***		-.16
		(-.26)		(-.36)		(-.43)
Social Science Major		.04		-.16		.28
		(-.18)		(-.24)		(-.31)
Technical Ability		1.72***		1.83***		2.19**
		(-.49)		(-.44)		(-1.05)
Broadband Internet		1.24***		.23		-.59
		(-.40)		(-.52)		(-.63)
Residing On-Campus		.21		.83***		1.09***
		(-.22)		(-.29)		(-.37)
Nagelkerke R^2	.116	.198	.273	.383	.137	.298

Note: Entries are unstandardized regression coefficients with standard errors in the parentheses.
*p <.10, **p<.05; ***p<.01

Two control variables in models 1B, 2B and 3B, gender and technical ability, are significant predictors of all three types of piracy. First and foremost, male college students are clearly more likely to be involved in music, software, and movie piracy than female college students. This finding was not unexpected, as previously research of computer crime has indicated a greater presence of piracy among males (Hinduja 2006; Skinner and Fream 1997). Similarly, technical ability is also a significant predictor with the more technically able students more likely to engage in piracy of all types. This finding is contrary to the non-significant findings involving technical ability measured with the frequency of computer use (Higgins and Makin 2004b; Higgins and Wilson 2006).

Four other control variables, race, class status, personal income, and on-campus residence, are significant predictors of two of the three types of piracy. First, race is a significant predictor of music and movie piracy (models 1B and 3B). As indicated by the results, individuals who identified themselves as White were less involved in

piracy than those who identified with any other race/ethnicity. Interestingly, closer inspection of the data shows that this effect is limited to individuals not or only slightly involved in piracy. Moderate and heavy involvement seems to be equally prevalent across races and ethnicities. Second, class year is also a significant predictor of music and movie piracy. Specifically, students in the latter years of their college career are more likely to be involved in movie piracy, while students beginning the college experience are more likely to be involved in music piracy. This finding differs from those of analyses using age, which found no significant influence on piracy (e.g., Higgins et al. 2005). Third, personal income is a significant predictor of software and movie piracy (models 2B and 3B). Its effects, however, are not in the direction that one would expect for a theft-based crime. Respondents who made more money separate from their family income are more likely to pirate software or movies. Finally, residing on campus is also a significant predictor of software and movie piracy involvement. The exact reason for this is not quite clear, especially when controlling for broadband Internet connections, which are more common in on-campus housing, but seems to indicate that university anti-piracy measures are not affecting university network-using students' opportunity to download illegally.

Two control variables, business major and broadband Internet access, are predictive of only a certain type of piracy. Compared to non-business, non-social science major students, business major students are significantly less likely to engage in software piracy. This finding is in line with findings from Hinduja (2003), yet the non-significant effect of social science major on piracy is contrary to the prior study's conclusions. Not surprisingly, broadband Internet access significantly influences music piracy. Students with broadband Internet are more likely to commit music piracy. Unexpected is the non-significant relationship between broadband Internet speed and software and movie piracy. This is especially surprising given the strong relationship with music piracy, in which students with faster Internet connections were more likely to pirate music, as software and movie piracy can require much more time with a slow connection speed in comparison to music piracy. The non-significant relationships, however, are possibly the result of few respondents (6%) possessing less than broadband connection speeds and software/movie piracy being relatively less common in comparison to music piracy. Overall, the three models with controls are moderately more successful at predicting piracy involvement than the models without control variables. The independent and control variables explain 19.8 percent of the variance in music piracy, 38.3 percent of the variance in software piracy, and 29.8 percent of the variance in movie piracy.

Looking now toward the results of the willingness analyses in Table 4, similar results can be found for the theoretically driven variables. As shown in models 4A, 5A and 6A, both differential association variables, peer activity and parental support, continue to be strong predictors of all three types of piracy. Students with pirating friends and supportive parents have a higher willingness to pirate. The deterrence variables, punishment certainty and punishment severity, continue to show only weak effects with only one of six effects significantly influencing piracy willingness. Students who believe punishment is more likely tend to have a lower willingness to pirate software. Compared to the four variables in models 1A, 2A and 3A, the same set of predictors have a stronger explanatory power. Together, they explain 26.2 percent of the variance in music piracy, 48.3 percent of the variance in software, and 50.4 percent of the variance in movie piracy.

Whereas the theoretical variables, especially differential association variables, exert similar effects on piracy in the involvement and willingness models, the control variables in the full models for willingness are not as predictive of piracy. Sixteen out of 30 relationships are significant when predicting involvement in piracy, while, as shown in models 4B, 5B, and 6B, only four are significant in predicting willingness. More specifically, technically able students generally have a higher willingness toward music and software piracy, while non-White students typically have a higher willingness to pirate movies. Class year also continues to significantly predict movie piracy, with students in the latter years of college having a lower willingness to pirate movies.

Overall, the explanatory power of the models increases when the dependent variable is changed from actual involvement in piracy to willingness. For the full models with statistical controls, the variance explained in music piracy increases to 29.6 percent, software piracy to 51.0 percent, and movie piracy to 51.9 percent. This increase appears to generate largely from changes in the coefficients of differential association variables. Using a test of regression coefficient equality (Paternoster et al. 1998), the substantive significance of coefficients in models 1A-3B was compared to their counterparts in models 4A-6B. Of the twelve coefficients estimated for the effects of peer activity and parental support on willingness, seven were significantly higher than their respective piracy involvement counterparts. In addition to the differential association variables, several other relationships experienced significant substantive increases and decreases. With the exception of punishment certainty's effect on movie piracy, all of these changes are among control variables becoming non-significant or having reduced effects in the willingness models, including gender in all models; broadband access in 1B; business major, technical ability, and residing on-campus in 2B; and class year and residing on-campus in 3B.

Table 4. Ordinal Logistic Regression Results for Piracy Willingness

Variables	Music		Software		Movies	
	Model 4A	Model 4B	Model 5A	Model 5B	Model 6A	Model 6B
Independent Variables						
Peer Activity	1.14***	1.02***	1.22***	1.17***	1.60***	1.61***
	(-.15)	(-.15)	(-.12)	(-.12)	(-.13)	(-.13)
Parental Support	.92***	.97***	1.03***	1.04***	.97***	.94***
	(-.14)	(-.14)	(-.14)	(-.15)	(-.14)	(-.14)
Punishment Certina	-.06	.05	-.32***	-.17	-.12	-.14
	(-.14)	(-.15)	(-.18)	(-.15)	(-.13)	(-.14)
Punishment Severity	.10	.08	-.14	-.17	-.09	-.10
	(-.17)	(-.17)	(-.18)	(-.19)	(-.18)	(-.19)
Control Variables						
Gender (0 = Female)		.02		.26		.08
		(-.18)		(-.18)		(-.19)
Race (0 = Non-White)		-.36		-.27		-.46*
		(-.26)		(-.26)		(-.26)
Class Year		.02		-.10		-.16*
		(-.09)		(-.09)		(-.09)
Parental Income		-.01		-.03		-.07
		(-.08)		(-.09)		(-.09)
Personal Income		.07		.06		.04
		(-.08)		(-.08)		(-.08)
Business Major		-.01		.30		.31
		(-.27)		(-.28)		(-.28)
Social Science Major		.09		-.07		-.03
		(-.19)		(-.19)		(-.19)
Technical Ability		1.68***		.77***		.30
		(-.41)		(-.23)		(-.25)
Broadband Internet		.00		.10		-.48
		(-.37)		(-.38)		(-.39)
Residing On-Campus		.11		-.33		-.25
		(-.22)		(-.22)		(-.23)
Nagelkerke R^2	.262	.296	.483	.510	.504	.519

Note: Entries are unstandardized regression coefficients with standard errors in the parentheses.
*p <.10, **p<.05; ***p<.01

DISCUSSION

This study investigated several aspects of Internet-based digital piracy. First, the empirical validity of differential association and deterrence as explanations for music, movie and software piracy was tested. Second, statistical controls were added to ascertain their importance in theory testing with digital piracy. Third, the results using piracy involvement were compared with the results of piracy willingness.

Several general conclusions can be drawn from the findings of this study. First, similar to prior research (e.g., Higgins and Makin 2004a; Skinner and Fream 1997), this study provides strong empirical support for differential association as a predictor of digital piracy. Specifically, peer activity and parental support are consistently strong predictors of piracy in all models. General deterrence, conversely, received very little empirical support. Punishment severity is not a significant predictor of the three types of piracy, while punishment certainty is a significant predictor of only software piracy in the two initial models.

Second, the analyses show that the conclusions reached regarding the effects of criminological antecedents of digital piracy may vary depending on which type of piracy is under study. Only four predictors, peer activity, parental support, gender, and technical ability, were significant predictors of all three types of piracy analyzed. The remaining significant predictors (punishment certainty, major, class year, etc.), conversely, varied in their statistical significance among differing types of piracy. This discrepancy implies music, software, and movie piracy are not entirely identical crimes, and such a difference may extend to different techniques of piracy as well. Thus, conclusions reached regarding one type of piracy (e.g., downloading software) may require additional empirical verification before being reached in regard to other types of piracy (e.g., downloading music). It should be noted that this study investigated only online piracy via downloading, and this is not necessarily synonymous with offline piracy, such as trading files with friends or ripping compact discs and digital video discs; nor is it synonymous with providing or uploading files.

Third, it appears that the introduction of additional control variables may alter findings relating to theoretical variables, a prospect that has been unaccounted for in prior research. In addition to identifying several statistically significant variables that have previously been untested (e.g., class year, residing on-campus), this study also found punishment certainty to be predictive of software piracy

only in the absence of statistical controls. This finding casts doubt on the importance of punishment certainty in deterring piracy as previously reported (Higgins et al. 2005).

Fourth, the discrepancy between willingness and involvement suggests that the two measures are quite similar, but not as synonymous as previous research (Higgins and Wilson 2006) has implied. Though the theoretically derived variables, punishment certainty notwithstanding, indicated no differences in statistical significance when tested with both of the measures, the amount of variance they explained increased with the willingness variable. More specifically, the majority of differential association coefficients increased in the willingness models. This would result in overestimating the substantive effects of these variables should willingness be used as a proxy for behavior. Additionally, the influences of control variables displayed quite distinctive results. Sixteen of 30 relationships were found to be significant with piracy involvement, but only four were significant when using the willingness measure. Overall, these findings indicate that willingness is quite similar to involvement in statistical analyses of digital piracy, yet a few noteworthy differences prevent it from truly being synonymous.

The key policy implication of this research is the importance of differential association. Obviously, association with deviant peers is not something that can easily be stopped. However, it appears that programs designed to educate students of the ethical aspects of piracy may benefit from encouraging communication with other students. Essentially, supporting differential association unfavorable to the violation of piracy laws may be a useful way to combat a social environment conducive to supporting piracy.

Unlike differential association, deterrence received very little empirical support in this study. This is not necessarily evidence against deterrence theory, however. Few participants felt that punishment was both certain and severe. Even if deterrence theory is applicable to digital piracy, a deterrence effect would not be possible until punishment severity and certainty increase and more students begin to perceive it as such. As long as most people perceive punishment as unlikely and weak, a deterrence effect will not occur regardless of the validity of deterrence theory. Based on this, it would seem that drastic changes to current policy and practices are required for a deterrence effect to even be possible.

A few limitations to this research must also be discussed. First, the data used are all self-reported. This may be problematic, especially for differential association variables, which ask participants about the behavior of others. It seems unlikely that participants intentionally falsified their responses. It is possible, however, that the responses were inaccurate perceptions of parental support and peer activity. Students may be unaware of their parents' beliefs relating to minor crimes rarely discussed. Thus, they may have simply guessed an answer that coincides with their own actions to normalize their behavior. Second, the data used in this study were cross-sectional. While it is quite unlikely that one would select peers based on a relatively minor and secretive part of one's life, these cross-sectional data do not disprove such a notion. Had punishment certainty and severity been significant predictors of piracy, time-order would be a greater concern, as individuals may become increasingly aware of the anonymity involved after experimenting with piracy. A related concern is that the conclusions drawn may not generalize beyond college students given that the sample was strictly drawn from a higher learning setting. Finally, rational choice research (Bouffard 2002) has indicated that subject-generated consequences may be a more viable method for measuring consequences and punishment. Though the responses for severity were partially based on the findings of prior research (Cooper and Harrison 2001), investigating additional potential consequences is beyond the scope of this study.

Future research on piracy should place an added emphasis on including statistical controls in analyses. Most prior research has been limited to three or fewer control variables when testing piracy. This study indicates that such inclusion may alter the significance of theoretically derived variables in some cases. It is clear that several control variables are related to piracy and have the potential to increase our understanding of the causes of piracy. Additionally, an effort should be made to better distinguish between willingness and involvement. The findings of this study indicate willingness may be easier to explain and may overestimate the effects of certain variables (e.g., differential association) while underestimating the effects of others (e.g., gender). This does not, however, mean that willingness is uninteresting. Rather, it simply indicates that involvement in piracy and a mindset conducive to piracy are part of the same phenomena, but are not completely identical.

Endnotes

1. Participants were presented with each of the following vignettes separately: 1) Daniel considers buying a new CD, but instead decides to download the songs for free; 2) John considers buying software, but instead decides to download it for free; 3) Hector considers buying a movie, but instead decides to download it for free. The scenarios were kept brief to prevent the introduction of mitigating circumstances in the hopes that the participant would respond to the crime and not specific events surrounding the particular scenario. For example, the vignettes used in prior studies describe the difficulties associated with finding and legitimately purchasing the media (Higgins, Fell, and Wilson 2006), reference high prices (Shore et al. 2001), or even directly state that it is unaffordable and required to pass a class (Higgins, Wilson, and Fell 2005). By introducing a specific neutralization,

the respondent may be more likely to respond favorably to the behavior. Moreover, even more mundane details, such as the type of music, may cause variation in responses. The method of download, too, could affect the responses, with high frequency offenders more likely to use (and, by extension, respond favorably to) more complex programs and transmission methods. Though longer vignettes may be useful for other purposes (e.g., a factorial design to determine the impact of introducing neutralization to the scenario), it would adversely affect the data in this particular case.

2. Because the willingness variable had to be measured with ordinal responses due to the hypothetical nature of the scenario, using an ordinal scale for involvement allows the two dependent variable categories to be comparable and allows the same type of regression analysis to be performed on each. Ranges such as these have been used previously (Skinner and Fream 1997), though the exact ranges have been adjusted to reflect more modern involvement levels.

3. Two primary reasons justify the recoding of the responses. First, not all of the categories could be logically ranked. Loss of Internet access, for example, could be more or less severe than a small fine depending on the particular respondent's perspective. Prior studies have indicated that both punishments are typically considered trivial (e.g., Cooper and Harrison 2001) and are thus included in the same group. Second, the categories of nothing and jail/prison were selected by relatively few of the participants (1.5%), suggesting that separate coding for the two categories may not be needed. Preliminary analyses indicated that the coding of severity had only minor influences on the significance of its relationship with piracy.

4. The controls for income incorporate two variables, as college students might not rely on a single source for financial support and a combination of personal earnings and parental support may play roles in a student's disposable income. Measures of parental income and personal income are admittedly somewhat crude. Because no prior studies of digital piracy have measured income among college students and their parents, these response categories were created without the benefit of prior research. Descriptive statistics for these variables imply the responses were chosen with moderate success. Though parental income responses indicated a higher social class than expected (with nearly half of students indicating a parental income in the highest category), the responses for personal income appear to be roughly normally distributed.

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