Digital Piracy in Europe:
Some first micro-evidence based on a German survey

Philipp Mandel & Bernd Süssmuth*

Munich University of Technology

Abstract

This paper is the first to empirically investigate determinants of digital piracy in Europe at the individual level going beyond the use of an undergraduate students' sample. To this end we rely on a survey comprising the behavior and attitudes of some 200 individuals. The sample is representative of the part of the German working population with high-speed internet access based on gender and age composition. It also maps the share of foreign nationals in Germany. In contrast to existing studies, we sharply discriminate between the frequency and the extent of pirating digital media. We find no significant gender difference in the propensity to pirate. However, male individuals are prone to pirate at a significantly larger scale. We attribute this finding to male individuals acting more frequently as hubs in the social prestige enhancing distribution of pirated media. Besides a DSL jack, the profile of a digital pirate is characterized by cost saving motives and the ease of overcoming protection.

Keywords: Piracy, intellectual property, survey, digital economy

JEL Codes: L82, L86, C42

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Correspondence:
Bernd Süssmuth
Department of Business and Economics
TUM Munich University of Technology
Arcisstr. 21, D-80333 Munich
Germany
++49 89 289 25709
suessmuth@wi.tum.de

1. Introduction

In a recent joint report by the European Commission and the European Patent Office the latest facts and figures on digital piracy[1] in Europe are reviewed. Accordingly, while at the world level sales of illegal music recordings account for 14 percent of the phonographic market, they have even outstripped the sales of genuine products since 2003 in the UK. By 2008 just one in 20 internet downloads is legal. Within the European Union (EU) pirated goods accounted for 10 percent of sales of music and 16 percent of motion picture sales at the beginning of the century. The Commission estimates that in the music sector alone implied VAT losses incurred by EU governments amount to $100 million per year. The total number of employees in the German recording industry steadily decreased from 112,000 in 2001 to 87,000 in 2007.[2] With regard to software piracy, figures of the industry's annual losses in Western Europe (that is, in the EU, Norway, and Switzerland) exceed $3 billion (European Commission and European Patent Office 2007). There is no doubt that digital piracy implies social and economic costs and social welfare losses for the EU.

One decade ago, the European Commission (1998) noted in a Green Paper on combating counterfeiting and piracy in the single market:

> *Counterfeiting and piracy in the Single Market are a phenomenon the nature and characteristics of which are little understood*. (p. 8).

[1] Digital piracy is the unauthorized use of copyrighted information goods. Varian (2000) defines an information good as anything that can be digitized. Primarily, music, movies, and software fall into this category. Digital products can be copied at almost no cost and are subject to non-commercial copying by final consumers. Because the copy of a copy typically does not deteriorate in quality, copies can become available on a large scale basis as in file-sharing networks (Peitz and Waelbroeck 2003, 2006). When a legal copyright exists, those who want to access the copyrighted original work (that may or may not be digitized) must pay the copyright holder an access price. If an individual obtains access without paying this price, that person is said to have incurred an act of piracy (Andrés 2006).

[2] Figures reported by the German council of music funds; http://www.musikindustrie.de

What has changed since then?

From an empirical economist point of view, we would say hardly anything. There has been made some progress on the theoretical frontier[3] and in cross-country studies.[4] However, an issue that hitherto has received merely any attention from applied economists is the variation in digital piracy behavior between individuals – let alone European individuals. A notable exception is Holm (2003). In general, quantitative research on digital piracy that is based on micro-level data is rare. Still the majority of the few studies in this vein are conducted and recognized outside the economics literature (see, e.g., Al-Rafee and Cronan 2006, Moores and Chang 2006, Hinduja 2007, and Goles *et al.* 2008).

The present study contributes to the literature in the following points. First, we follow an integrated approach in considering the major occurrences of digital piracy in the contemporary world (at least) for EU-15: music, movies, software, and video games. Second, several studies claim that gender affects digital piracy. In particular, it is either found that male individuals are "more likely to pirate" (Sims *et al.* 1996, Hinduja 2003, Higgins 2006) or that gender explains a notable part of measured piracy behavior[5] (see, among others, Solomon and O'Brien 1990, Holm 2003). Here, we follow a different strategy by discriminating between the frequency and the extent of pirating and controlling for demographic factors, respectively. Finally, in contrast to existing studies

[3] See Peitz and Waelbroeck (2006) for a critical review.

[4] See Holm (2003), Banerjee *et al.* (2005), Van Kranenburg and Hogenbirk (2005), and Andrés (2006).

[5] Piracy behavior is measured, for example, as the share of illegal copies in a subject's collection of music, computer games and software programs (Holm 2003, p. 3).

our sample does not rely on undergraduate students as sole respondents but is representative for the German working population with high-speed internet access.

2. Data and Empirical Approach

Our sample is stratified so as to match the gender composition of German employees subject to social insurance contributions. The corresponding five years average female employee share is supportive for the 40 percent used in our query.[6] With regard to the age composition of our sample, we replicate the age structure of the German population using a broadband technology to access the internet. As reported in TNS Infratest (2007), the use of fixed and/or other broadband[7] technologies is the most prominent for individuals in their twenties. Besides this core of users, the second largest group is made of the first half of thirty-somethings and teenagers. For individuals of age beyond 39 the share of broadband users significantly falls. Our survey is representative of this type of age structure of German high-speed "onliners." Detailed summary statistics on the age structure of our sample is given in the first columns of Table 2 below. Our share of foreign respondents and respondents with a migration background living in Germany maps the share of about one fifth of the German population as reported in the latest official statistics (Statistisches Bundesamt 2007, p. 37).

We conducted our survey during the seven months from April to October 2006. Respondents were recruited online and offline. The call for participation in the survey was announced several times in a series of courses targeted toward undergraduate students at Munich University of Technology. Additionally, we sent more than 1,500

[6] Annual reports and statistics on the structure of the German working population are available online from the Federal Employment Office: http://www.pub.arbeitsamt.de/hst/services/statistik/.

[7] In particular, this implies the Universal Mobile Telecommunications System (UMTS) standard.

emails containing a URL directing to our survey's webpage along with an invitation to participate. The questionnaire took 5-10 minutes to get filled out. The online platform was designed so as to let participants choose between a questionnaire in German or English. Questions were asked open-ended as well as in the form of questions with a given set of alternative answers. See Appendix B for detail. Since some questions concerned illegal activities, anonymity was assured. As soon as our sample was stratified to match the structure outlined above, we ended the survey. This was the case in October 2006 when 222 subjects had participated.

The retrievable information from our query can be summarized in three broad categories: information on the extent and frequency of pirating digital media (dependent variables), on demographic characteristics (binary variables), and on attitude (categorical variables). A detailed overview is given in Appendix A. As our starting point, we consider the following two specifications:

$$FREQ_i = \alpha + \sum_{j=1}^{N_D} \beta_j D_{j,i} + \sum_{h=1}^{N_A} \gamma_h A_{h,i} + \varepsilon_i \tag{2.1}$$

$$XSAVE_i = \alpha + \sum_{j=1}^{N_D} \beta_j D_{j,i} + \sum_{h=1}^{N_A} \gamma_h A_{h,i} + \varepsilon_i, \tag{2.2}$$

where $FREQ_i$ and $XSAVE_i$ refer to the i-th individual and are the self-assessed pirating frequency[8] and the annual amount of money saved by pirating. $D_{j,i}$ is a set of $N_D = 7$ individual demographic characteristics. $A_{h,i}$ denotes $N_A = 4$ subject specific variables reflecting motives and attitude toward digital piracy. Finally, ε_i are standard i.i.d. error terms.

[8] The assessment ranges from 1 = never to 4 = often; see Appendix A and Appendix B for further detail.

As our dependent variable $FREQ_i$ in (2.1) represents the outcome of a typical categorical rating neither a multinomial nonlinear probability model nor OLS measure up to the nature of these data. This is due to the fact that both methods cannot cope with the ordinality of the data. For example, LS estimates always treat intervals between categories identically. However, they may vary in length for our survey's respondents. Therefore, we also consider an ordered Probit specification with three thresholds

$$FREQ_i = \begin{cases} 1 \quad \text{for} \quad FREQ_i^* = 0 \\ 2 \quad \text{for} \quad 0 < FREQ_i^* \leq \tau_1 \\ 3 \quad \text{for} \quad \tau_1 < FREQ_i^* \leq \tau_2 \\ 4 \quad \text{for} \quad FREQ_i^* > \tau_2 \end{cases} \tag{2.3}$$

$$\text{with} \quad FREQ_i^* = \alpha + \sum_{j=1}^{N_D} \beta_j D_{j,i} + \sum_{h=1}^{N_A} \gamma_h A_{h,i} + \varepsilon_i ,$$

where thresholds are denoted by τ, and $FREQ_i^*$ is the latent variable.

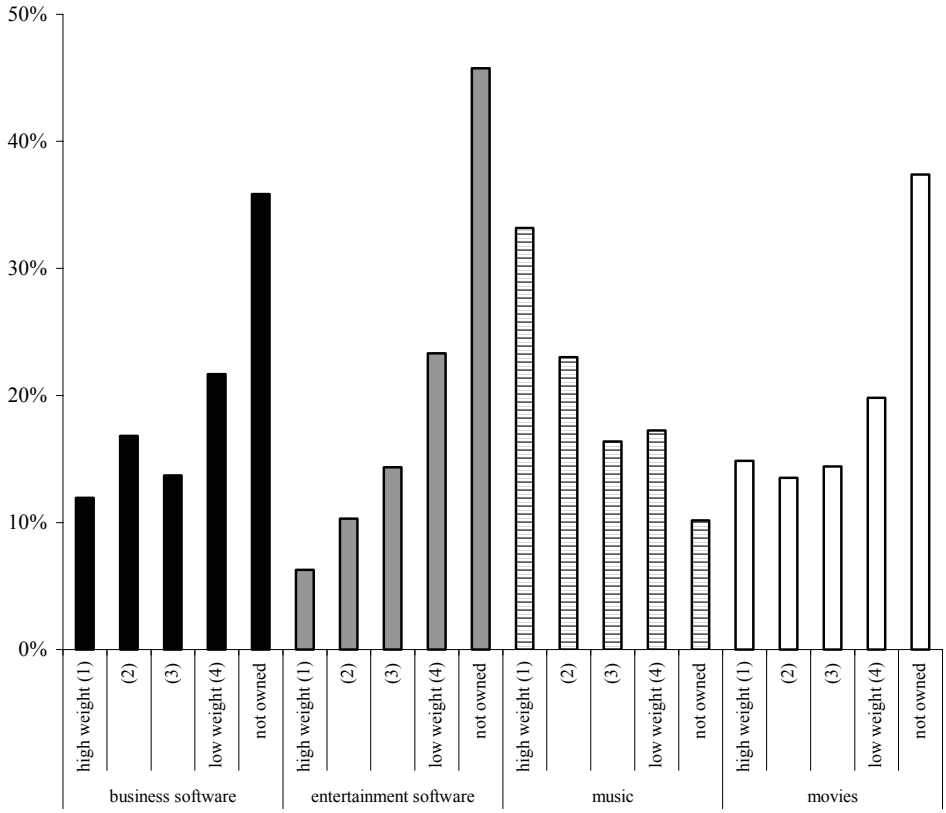
Similarly, as the distribution of $XSAVE_i$ is clearly left censored at a zero value we consider a standard censored (Tobit) regression model to estimate (2.2).

3. Findings

As can be seen from Figure 1, German internet users place the highest weight on music when it comes to assess the relative importance of different categories of pirated digital media in their collections. In line with the European trend only 10 percent of respondents do not own illegally acquired music files. The second most relevant portfolio share (in terms of quality and saved cost) is made up of movies followed closely by business software. Nearly one half of German internet users do not own pirated entertainment

software like video games. Less than 10 percent put a high weight on this type of digital products in their collections.

Figure 1. Weighted portfolio shares of illegally acquired digital media by type



Note: Weighted by quantity and amount of money saved.

In order to avoid issues of collinearity and to assess the particular relevance of the "student status" in pirating digital media,[9] we estimate two sets of specifications of models (2.1), (2.2), (2.3), and a censored version of (2.1), respectively: Specifications i to vi control for the age structure of the German population with broadband internet access

[9] Holm (2003), for example, emphasizes the timely computer skills of students and their relatively large size of network of friends with skills and interest in computers and access to digital media copies.

using three distinct age dummies, while specifications vii to xii rely on a student dummy only.

We start our interpretation of results with models explaining the individual frequency of pirating digital media $FREQ_i$ (Table 3 and 4). This dependent represents a general and ordinal self-assessment ranging from 1 = never to 4 = often. Overall the specifications explain up to one fifth to one fourth of the variation in $FREQ_i$. Obviously, the individual age matters. Other things equal, the age group representing the youngest subjects (< 21 years old) is associated with a higher frequency of pirating digital media. This fixed age effect is estimated significantly throughout and decreases with age. In contrast, the student dummy is estimated to have a statistically significant effect only in specifications, where we do not control for the self-assessed weight of the reason for pirating being the budget constraint. It is, therefore, straightforward to presume that in specifications x and xi *STUD* instruments issues of affordability. A finding in stark contrast to the literature that claims that male subjects are "more likely to pirate" (Sims *et al.* 1996, Hinduja 2003, Higgins 2006) is the following: As can be seen from Table 3 and 4, gender is found to have no effect on the individual frequency of digital piracy that is statistically different from zero. In terms of size the negative impact of being of German nationality is the most profound. It is followed by a highly significant positive effect from having access to a DSL connection. We also find a sizable and significant negative impact from the perceived degree of complexity implied by pirating digital products. The perceived probability to get prosecuted for pirating and the budget constraint impact significantly negative (at a 5 percent level). Both effects are of similar size.

Our regressions' output for explaining the individual extent of digital piracy $XSAVE_i$ (Table 5 and 6) gives a somehow different picture. It justifies our strategy of separating frequency and extent. As can be seen from specifications iii to v and, in particular, from specification vi, the age group *AGE2125*, representing respondents in their early twenties, stands out. It is this age group which can be seen as predominantly responsible for the overall extent of digital piracy – both in terms of statistical significance and size. Although we estimate significant coefficients, cost saving motives (*BUDGET*) play but a minor role in the explanation of the individual extent of digital piracy. The positive impact from a DSL connection has neither a robust (it is merely significant in our censored regressions) nor a particularly strong effect.

Our most remarkable finding, however, is that male individuals – given that they pirate at all – do it at a significantly larger scale.[10] This result is also in line with most of the findings of the existing literature that attribute a notable part of measured piracy behavior to gender differences (Sims *et al.* 1996, Hinduja 2003, Higgins 2006, Solomon and O'Brien 1990, Holm 2003). The explanations of these gender differences are diverse. However, they are all rooted in the argument that females have higher ethical standards than males. We do not subscribe to this view: Given that higher ethical standards are at the heart of the gender differences we would expect a difference both in the extent as well as in the frequency of pirating. But given that we find a profound gender difference for the extent and no gender difference for the frequency of pirating, how can this be reconciled with the existing evidence to make a common sense?

[10] Throughout our estimation results reported in Table 5 and 6, *MALE* clearly shows the largest and most significant coefficient estimates (apart from the *AGE2125* dummy).

The answer is to be found in the combination of the recent development of the digital economy and the role played by male individuals. We will discuss both successively.

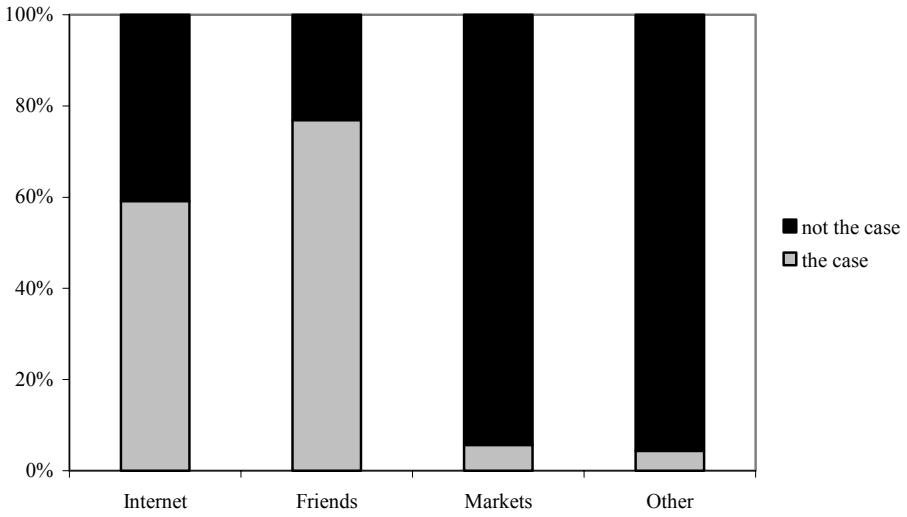
As Peitz and Waelbroeck (2003) note digital products involve interactions. For music and video files "about which people like to talk" they particularly imply social interaction. In times of "hard-drive parties" turning from a widely unrecognized phenomenon into a fad, it is above all social interactions that come to the fore. The following statement by British music producer Cliff Jones makes the point:

> *The latest cultural import from America is the hard-drive party. It involves takeaway pizza, beer and the swapping of the contents of 500Gb hard drives, packed full of thousands of music tracks. My own neighbour, resolutely middle-class, with two young children at a church school, proudly told me last weekend that he has 80,000 classic tracks on a drive he got free from a friend. At a rough guess, that's £60,000 of stolen music.*
>
> The *Sunday Times*, August 10, 2008

The differentiation by Peitz and Walbroeck (2003, p. 1) according to which digital piracy is done in two ways, either by downloading from the internet or by using networks of friends sharing digital products on a "small-scale basis" seems no longer valid. A terabyte, that is, approximately 200,000 digitized recordings, is a standard unit of exchange at hard-drive parties. In these dimensions and in such social gatherings, it is no longer the social prestige of the legal owner that is increased (Peitz and Waelbroeck 2003, p. 10) but the social prestige of the first illegal owner.

According to our survey, in Germany the most frequently used channels of distribution and hubs of pirated digital media are friends; see Figure 2.

Figure 2. Channels of distribution and hubs of pirated digital media



Given that male individuals act more frequently as such hubs in social networks, we can explain both of our findings (i.e., a profound gender difference for the extent and no difference for the frequency of pirating). Indeed information drawn from our survey points into this direction (Table 7). While male individuals on average get hold of illegally acquired digital media more frequently through the internet, females do so more frequently through their circle of friends. These differences can easily be found to be significant at a 5 percent level of significance in corresponding mean difference tests.

4. Conclusion

In this paper we empirically investigated determinants of digital piracy. To this end we conducted a representative survey comprising the behavior and attitudes of some 200 German individuals. Although we did not address the issue of causality, for example, in a quasi-experimental set-up, our study overcomes issues of selectivity and offers a new explanation of gender differences: As we identified a gender gap for the extent but not

the frequency of pirating, this explanation ascribes male subjects the role of hubs and female subjects the role of beneficiaries from indirect appropriation in the spread of pirated media. Our survey's data reinforce this hypothesis.

Table 1. Summary statistics: dependent variables

	XSAVE	*FREQ*
Mean	409.95	2.369
Max	10,000.00	4.0
Min	0.00	1.0
Range	10,000.00	4.0
Std. dev.	934.91	0.922
Median	125.00	2.0
N	222	222

Note: For detail on definition and construction of variables see Appendix A and Appendix B.

Table 2. Summary statistics: independent variables

	AGE20	*AGE2125*	*AGE2635*	*STUD*	*MALE*	*DSL*	*PPROS*	*TRIAL*	*COMPLX*	*BUDGET*
Mean	0.122	0.604	0.239	0.689	0.590	0.802	2.347	3.179	2.853	3.281
Max							5.0	5.0	5.0	5.0
Min							1.0	1.0	1.0	1.0
Range							4.0	4.0	4.0	4.0
Std. dev.	0.328	0.490	0.427	0.464	0.493	0.400	0.998	1.203	1.320	1.257
Kurtosis	6.361	1.179	2.502	1.669	1.134	3.293	2.170	2.178	1.903	1.972
Skewness	2.315	-0.424	1.226	-0.818	-0.366	-1.514	0.139	-0.139	0.285	-0.228
Median							2.0	3.0	2.750	3.50
N	222	222	222	222	222	222	222	209	208	208

Note: For detail on definition and construction of variables see Appendix A and Appendix B.

Table 3. Determinants of the individual *frequency* of digital piracy: OLS specifications

	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
AGE20	1.306*** (0.00)	1.330*** (0.00)	1.219*** (0.00)	1.300*** (0.00)	1.131*** (0.00)	1.070*** (0.00)	--	--	--	--	--	--
AGE2125	1.190*** (0.00)	1.208*** (0.00)	1.111*** (0.00)	1.225*** (0.00)	1.033*** (0.00)	0.908*** (0.00)	--	--	--	--	--	--
AGE2635	1.014*** (0.00)	0.988*** (0.00)	0.904*** (0.00)	0.983*** (0.00)	0.805*** (0.00)	0.727*** (0.00)	--	--	--	--	--	--
STUD	--	--	--	--	--	--	0.157 (0.23)	0.192 (0.16)	0.200 (0.13)	0.249* (0.06)	0.219* (0.07)	0.077 (0.55)
MALE		0.176 (0.16)	0.123 (0.33)	0.053 (0.67)	0.105 (0.40)	0.060 (0.64)		0.160 (0.21)	0.096 (0.47)	0.035 (0.79)	0.087 (0.47)	0.014 (0.91)
DSL			0.300** (0.04)	0.367** (0.03)	0.405*** (0.00)	0.431*** (0.00)			0.395** (0.01)	0.415*** (0.00)	0.502*** (0.00)	0.498*** (0.00)
PPROS				-0.174** (0.01)	-0.144** (0.02)	-0.120** (0.05)				-0.160** (0.01)	-0.131** (0.03)	-0.103* (0.09)
NATION					-0.848*** (0.00)	-0.612*** (0.00)					-0.894*** (0.00)	-0.637*** (0.00)
TRIAL						-0.076 (0.14)						-0.079 (0.13)
COMPLX						-0.140*** (0.00)						-0.156*** (0.00)
BUDGET						-0.111** (0.02)						-0.121** (0.02)
N	222	222	222	222	222	207	222	222	222	222	222	207
R^2 adj. (%)	5.22	5.64	6.77	9.75	20.54	28.51	0.18	0.43	2.81	5.23	17.26	25.27
Ln L	-288.91	-287.91	-286.06	-281.93	-267.29	-234.49	-295.68	-294.90	-291.70	-288.39	-272.81	-240.13

Notes: *, **, *** denotes significance at 10, 5, 1% level of significance; p-values are given in parentheses and are based on White heteroscedasticity-consistent variance-covariance matrices (White 1980); all specifications i – xii include a constant.

Table 4. Determinants of the individual *frequency* of digital piracy: Ordered Probit specifications

	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
AGE20	1.980*** (0.00)	2.010*** (0.00)	1.890*** (0.00)	2.030*** (0.00)	1.907*** (0.00)	2.486*** (0.00)	--	--	--	--	--	--
AGE2125	1.840*** (0.00)	1.859*** (0.00)	1.758*** (0.00)	1.940*** (0.00)	1.774*** (0.00)	2.239*** (0.00)	--	--	--	--	--	--
AGE2635	1.649*** (0.00)	1.620*** (0.00)	1.539*** (0.00)	1.664*** (0.00)	1.497*** (0.00)	2.003*** (0.00)	--	--	--	--	--	--
STUD	--	--	--	--	--	--	0.177 (0.26)	0.218 (0.17)	0.231 (0.14)	0.293* (0.06)	0.275* (0.08)	0.105 (0.56)
MALE		0.206 (0.17)	0.145 (0.33)	0.052 (0.74)	0.136 (0.40)	0.108 (0.54)		0.187 (0.20)	0.113 (0.44)	0.036 (0.81)	0.118 (0.45)	0.032 (0.85)
DSL			0.377** (0.04)	0.404** (0.03)	0.568*** (0.00)	0.692*** (0.00)			0.484*** (0.01)	0.520*** (0.00)	0.678*** (0.00)	0.742*** (0.00)
PPROS				-0.230*** (0.00)	-0.212*** (0.01)	-0.193** (0.02)				-0.204*** (0.01)	-0.188** (0.01)	-0.159* (0.06)
NATION					-1.088*** (0.00)	-0.825*** (0.00)					-1.128*** (0.00)	-0.844*** (0.00)
TRIAL						-0.115 (0.11)						-0.119 (0.10)
COMPLX						-0.221*** (0.00)						-0.231*** (0.00)
BUDGET						-0.175** (0.01)						-0.178** (0.01)
N	222	222	222	222	222	207	222	222	222	222	222	207
Pseudo-R^2 (%)	3.25	3.58	4.28	5.88	10.56	16.33	0.23	0.50	1.70	2.98	8.08	13.15
Ln L	-274.35	-273.41	-271.42	-266.88	-253.63	-220.86	-282.92	-282.13	-278.73	-275.11	-260.66	-229.26

Notes: *, **, *** denotes significance at 10, 5, 1% level of significance; p-values are given in parentheses and are based on Huber/White-robust (quasi-maximum likelihood) sandwich variance-covariance matrices (Huber 1967, White 1980); the Pseudo-R² is of Aldrich/Nelson-type (LR-index).

Table 5. Determinants of the individual *extent* of digital piracy: OLS specifications

	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
AGE20	272.22*** (0.00)	327.21*** (0.00)	268.91** (0.02)	284.01** (0.01)	286.44** (0.01)	253.01 (0.14)	--	--	--	--	--	--
AGE2125	495.86*** (0.00)	529.45*** (0.00)	479.78*** (0.00)	501.17*** (0.00)	503.93*** (0.00)	488.33*** (0.01)	--	--	--	--	--	--
AGE2635	220.09*** (0.00)	163.17** (0.05)	119.16 (0.25)	134.08 (0.22)	136.65 (0.20)	160.38 (0.31)	--	--	--	--	--	--
STUD	--	--	--	--	--	--	209.70** (0.03)	292.09** (0.01)	296.26** (0.01)	305.40*** (0.01)	305.31*** (0.01)	221.19** (0.03)
MALE		383.12*** (0.00)	355.58*** (0.00)	342.46*** (0.01)	341.17*** (0.01)	361.14** (0.02)		381.01*** (0.00)	348.71*** (0.00)	337.17*** (0.01)	337.32*** (0.01)	351.23** (0.02)
DSL			154.46** (0.03)	156.90** (0.03)	155.51*** (0.02)	193.15** (0.03)			198.27*** (0.01)	202.12*** (0.01)	202.38*** (0.01)	231.13** (0.02)
PPROS				-32.67 (0.57)	-33.10 (0.56)	-42.82 (0.45)				-30.28 (0.59)	-30.20 (0.59)	-34.30 (0.55)
NATION					12.23 (0.89)	146.84 (0.20)					-2.63 (0.98)	123.74 (0.25)
TRIAL						39.58 (0.56)						36.72 (0.58)
COMPLX						-24.93 (0.59)						-24.64 (0.59)
BUDGET						-149.18** (0.05)						-141.70* (0.05)
N	222	222	222	222	222	207	222	222	222	222	222	207
R^2 adj. (%)	1.05	4.60	4.53	4.20	3.80	5.96	0.63	4.08	4.34	4.00	3.55	5.27
Ln L	-1830.40	-1825.88	-1825.40	-1825.27	-1825.26	-1703.80	-1831.88	-1827.44	-1826.64	-1826.83	-1826.53	-1705.61

Notes: *, **, *** denotes significance at 10, 5, 1% level of significance; p-values are given in parentheses and are based on White heteroscedasticity-consistent variance-covariance matrices (White 1980); all specifications i – xii include a constant.

Table 6. Determinants of the individual *extent* of digital piracy: Tobit specifications

	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
AGE20	631.50** (0.03)	670.45** (0.02)	618.40** (0.04)	650.59** (0.03)	661.97** (0.03)	726.31* (0.05)	--	--	--	--	--	--
AGE2125	938.95*** (0.00)	952.55*** (0.00)	908.96*** (0.01)	952.91*** (0.00)	965.12*** (0.00)	1051.10** (0.01)	--	--	--	--	--	--
AGE2635	632.63** (0.02)	548.74** (0.05)	510.30* (0.08)	537.59* (0.06)	547.82* (0.06)	683.80* (0.06)	--	--	--	--	--	--
STUD	--	--	--	--	--	--	216.21* (0.05)	396.57** (0.02)	301.05** (0.02)	317.03** (0.01)	317.13** (0.01)	226.11** (0.04)
MALE		392.13*** (0.00)	372.03*** (0.01)	347.71** (0.01)	345.19** (0.01)	398.85** (0.01)		383.28*** (0.00)	353.81*** (0.01)	334.68** (0.01)	334.48** (0.01)	373.71** (0.02)
DSL			114.24 (0.17)	114.48 (0.18)	108.27 (0.19)	168.95 (0.10)			185.21** (0.04)	188.71** (0.03)	188.33** (0.03)	232.79** (0.04)
PPROS				-65.20 (0.28)	-68.16 (0.26)	-59.38 (0.32)				-52.33 (0.41)	-52.46 (0.40)	-37.12 (0.56)
NATION					50.63 (0.67)	210.06 (0.12)					3.73 (0.97)	164.67 (0.21)
TRIAL						58.03 (0.43)						49.19 (0.50)
COMPLX						-50.22 (0.30)						-55.91 (0.25)
BUDGET						-158.39** (0.04)						-152.73** (0.05)
N	222	222	222	222	222	207	222	222	222	222	222	207
Ln L	-1651.33	-1647.46	-1647.24	-1646.78	-1646.76	-1564.93	-1654.63	-1650.95	-1650.37	-1650.01	-1650.01	-1568.88

Notes: *, **, *** denotes significance at 10, 5, 1% level of significance; p-values are given in parentheses and are based on Huber/White-robust (quasi-maximum likelihood) sandwich variance-covariance matrices (Huber 1967, White 1980); the Pseudo-R^2 is of Aldrich/Nelson-type (LR-index).

Table 7. Means (shares) and variances of sources of pirated digital media by gender

	MALE	*FEMALE*
Mean $\mid_{\text{source = internet}}$	0.64	0.53
Mean $\mid_{\text{source = friends}}$	0.73	0.83
Var $\mid_{\text{source = internet}}$	0.23	0.25
Var $\mid_{\text{source = friends}}$	0.20	0.14

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Appendix A

List of abbreviations and variables

Dependent variables

XSAVE	–	Amount of money saved by pirating digital media per year
FREQ	–	Self-assessment of the frequency of pirating (ranges from 1 to 4; with 1 = never)

Independent variables: binary

AGE20	–	Individual aged < 21 years
AGE2125	–	Individual aged between 21 and 25 years
AGE2635	–	Individual aged between 26 and 35 years
STUD	–	Individual enrolled at a university as student
MALE	–	Gender dummy (with 1 = male)
DSL	–	Individual with a DSL internet access
NATION	–	Individual is of German nationality

Independent variables: categorical

PPROS	–	Perceived probability to get prosecuted for pirating digital media (ranges from 1 to 5; with 5 = very high)
TRIAL	–	Self-assessed weight of the reason for pirating being to try out the product (ranges from 1 to 5; with 1 = the only reason is trial; see Appendix B)
COMPLX	–	Self-assessed degree of implied complexity of pirating digital media (ranges from 1 to 5; with 1 = very easy; see Appendix B)
BUDGET	–	Self-assessed weight of the reason for pirating being the budget constraint (ranges from 1 to 5; with 1 = the only reason is the budget constraint)

Appendix B

The original questionnaire included a few more questions, for example, on the religious background of subjects. The ones displayed in the following are the ones selected to construct the variables of our study (Appendix A).

Gender?

- male
- female

Age?

- under 20
- 21 to 25
- 26 to 35
- over 36

Profession or occupation?

- secondary education
- higher education
- worker/employee
- self-employed

Nationality?
Please tell us your country of origin. Choose from the list below.

--- Choice of 10 (groups of) countries

In this questionnaire digital media always include business software (e.g., MS-Office products, Photoshop), entertainment software (e.g. video console games), music, and movies.

Do you own a PC and/or notebook?

- yes
- no

What kind of internet access do you use at home?

- DSL
- ISDN
- cable modem (analogue)
- none
-

The digital media that you did not obtain legally primarily (in terms of quantity / price) exist of:
Please tick "1" for "to a very high degree the case" to "4" for "merely the case" or "none"

	1	2	3	4	none
business software	☐	☐	☐	☐	☐
entertainment software	☐	☐	☐	☐	☐
music	☐	☐	☐	☐	☐
movies	☐	☐	☐	☐	☐

How do you usually get hold of illegally acquired digital media?

- through the internet
- through friends
- through markets
-

How often do you yourself engage in accessing digital media without paying for it? (e.g., using a file sharing platform or program)

- ☐ never
- ☐ hardly ever
- ☐ sometimes
- ☐ often

How much money (in €) do you save per year through illegally obtained digital media?

_____

What are your personal motives for illegally acquiring digital media?
Please choose from "1" (to a very high degree the case) to "5" (absolutely not the case)

	1	2	3	4	5
These products are too highly priced	☐	☐	☐	☐	☐
I just want to try out the products	☐	☐	☐	☐	☐
I cannot afford these media	☐	☐	☐	☐	☐
I only use it for a short period	☐	☐	☐	☐	☐
It is easy to get hold of these products illegally	☐	☐	☐	☐	☐
There is only a slim chance of getting caught	☐	☐	☐	☐	☐
Most people I know do it the same way	☐	☐	☐	☐	☐

Please, assess the probability of getting prosecuted for illegally obtaining digital media. It is…

- ☐ very improbable
- ☐ improbable
- ☐ possible
- ☐ probable
- ☐ very probable