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"THOU SHALT NOT LEECH"
ARE DIGITAL PIRATES CONDITIONAL
COOPERATORS?

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“Thou shalt not leech” Are digital pirates conditional cooperators?

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Abstract

In this project we investigate willingness to share and download cultural content by implementing a novel “piracy game” modelled after standard public good games. Subjects' decisions have real consequence, as they are rewarded with individual “transfer” on a file-sharing service. We find that willingness to share depends positively on the sharing by others. Interestingly, however, this tendency does not seem to be associated with reciprocity or other-regarding social preferences. We employ several measures of sharing – from self-reporting to experimental – and incorporate to the analysis other factors which may explain the autonomous willingness to share, irrespective of the group effects. We find that conditional cooperation in content sharing is fairly prevalent, but unrelated to personality traits, attitude towards risk, attitude towards the other, marginal valuation, as well as socio-demographic characteristics.

Keywords:

digital piracy, Big Five, public goods, laboratory experiment

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*The whole thing about the torrent community is share and share alike.
Or maintaing a healthy give and take ratio.
Other people are giving valuable bytes, so should you.*

– Copy’nPaste (2013), original spelling retained

1 Introduction

In the early days of computer piracy, the market was dominated by (semi-)professional sellers. Although they offered much lower prices (saving on property rights and marketing), their modus operandi and orientation for profit resembled that of official distributors. Free-of-charge exchanges occurred (if at all) only between relatives and friends. However, with the advent of Internet and technologies such as Peer-to-Peer (P2P) networks, everyone can become a seemingly anonymous supplier. This applies even to those, who merely want to download, as P2P pushes users to share even the little they have already acquired, a mechanism that greatly facilitates rapid distribution of files. With P2P, new types of large communities have emerged that comprise thousands of Internet users who do not know one another and have only one thing in common – the files they want to download. The rules that organize these communities are simple: if you want to take, you should also give. Thus an essential feature of modern digital piracy is that it involves *sharing* or *exchange* of files among interested individuals. Users that restrict their activity to downloading, without contributing to the community, are frowned upon.¹

In this project we seek to explore the strength of reciprocity norms among digital pirates. Towards this end we let our student subjects play a number of experimental games that allow identifying reciprocal or conditional cooperation (as opposed to general altruism or preference for equity for example) and compare if these are more prevalent among pirates than non-pirates. The two categories are distinguished based on self-reports but also actual behavior in our imitated file-sharing network (“piracy game”). Additionally, in a post-experiment questionnaire we elicit basic personality measures.

Sharing content online is a particularly strong case for free-riding in the context of the public (informational or cultural) goods, see Feldman and Chuang (2005); Karakaya et al. (2009). The very nature of the hosting services is that content posted by one user is available to all other users.² While typically public good games are considered in the context of reciprocity (Fehr and Gächter, 2000; Falk and Fischbacher, 2006) and conditional cooperation (Fischbacher et al., 2001; Frey and Meier, 2004)³, we apply it to sharing transfer with unknown team members.

We seek to contribute to existing literature in several ways. As far as we know, this is the first attempt to link piracy behaviors with economic measures of other-regarding preferences. Second, most of the previous related developments focused on self-reported behavior – the information collected with questionnaires, which is always problematic with ethically or legally controversial actions. Our study aims at analyzing actual behavior with real consequences in a controlled environment. Third, our design allows us to link this behavior to self-reports, shedding light on the reliability of both approaches.

Our framework allows us not only to measure online behavior, but also to put a value tag on 1 GB of data for each of the experiment participants, we can thus tell what stakes are involved. Fifth, while most studies focus solely on downloading (or work with the diffuse term “piracy”), we specifically differentiate between downloading and sharing, and are therefore able to study these two behaviors separately. Sixth, we use the abridged version of the popular Big Five inventory to assess five major personality traits of the participants, allowing us to connect these traits to online actions. This can shed light on determinants of file sharing and its similarity to other non-violent crimes. Finally, we link piracy behavior to a measure of risk aversion which in principle should moderate effectiveness of legal sanctions against copyright infringement.

Our main finding is that (self-reported) piracy behavior *cannot* be connected to differences in reciprocity or other personality traits we study. Yet, it is strongly and positively correlated with the value one assigns to downloading cultural content from the internet. This finding has strong

¹For a more comprehensive history of “piracy” and file-sharing technology, see . Dahlstrom et al. (2006).

²Clearly, in the commercial context, the hosting service provider is capitalizing on the difference between individual willingness to share and individual willingness to acquire as well as relative sizes of these populations.

³See Chaudhuri (2011) for a review of recent literature with special emphasis on laboratory experiments.

policy implications, as it shows that sharing is associated with high utility of consumption rather than low willingness to pay. Furthermore, we provide a methodological contribution by showing that self-reports are only weakly related to willingness to actually acquire unauthorized content in our “piracy game”. This finding is important for further studies of the phenomenon, as until now a large body of literature is based on hypothetical surveys.

2 Literature review

Our study builds on insights from two strands of economic research. The first investigates sharing and downloading of cultural content. The second involves incorporating individual traits into experimental analysis of economic choices. Of course, we are interested here in potential determinants of willingness to share: the role of other-regarding preference, attitude towards risk and selected personality traits.

2.1 Reciprocity in file-sharing networks

It is widely recognized in the literature that having many members distribute files is crucial for performance of a network. As a result, various mechanisms promoting such behavior or punishing free riding have been proposed and built into network architecture – see Feldman and Chuang (2005) for an overview of first file-sharing networks. In fact, the presently most popular file-sharing network protocol⁴ – BitTorrent – is based on simultaneous downloading and sharing and does not allow for full blockage of the latter. It achieves this by suppressing download speed when the user reduces the upload speed.

The download/upload ratio incentive pertains only to the files already in the network, where a large number of ‘seeders’ is required for higher download speeds and longer availability. There are, however, no directly implemented incentives for BitTorrent users to upload new content (hitherto not available via torrents). Some torrent trackers or communities (i.e. search engines for torrent files or forums facilitating torrent-hosting) include incentives like reputation points and recognition status on forums. That is e.g. true for the popular Pirate Bay. The particular choice of incentives used seems important for the cooperation levels of network users – see e.g. Andrade et al. (2005) for an analysis of sharing behaviour in various communities and Beekhuyzen and von Hellens (2009) for a specific case of community-enforced reciprocity.

Informal sanctions, however, are also widely used. The torrent network community puts a high emphasis on the give and take ratio, condemning selfish behavior – e.g. sharers are referred to as *seeders*, while downloaders as *leechers*. It is also telling that the developers of the only BitTorrent software able to completely suppress sharing by “cheating” the protocol, the “Free Riding BitTorrent Client”, decided to call it *BitThief* (Locher et al., 2006).

Technical solutions to the potential ‘free-riding’ problem in P2P networks have received some attention in the scholarly literature (Ramaswamy and Liu, 2003; Cunningham et al., 2004; Purandare and Guha, 2006; Li et al., 2008; Mol et al., 2008). Others focused on the actual dynamics of file exchange on P2P networks. Dejean et al. (2010) found that although free-riding exists, many torrent users cooperate in file-sharing. Moreover, they reported that individual propensity to cooperate in P2P networks is lower in larger communities, suggesting an effect similar to that of a public good. On the other hand, cooperation seems stronger in ‘specialized’ (e.g. only music sharing) communities. Cuevas et al. (2010) showed that when it comes to uploading new content, only a small fraction of users (possibly representatives of hacker groups) is responsible for most of the uploads and, moreover, that some of these ‘publishers’ may actually derive financial benefits from the sharing.

2.2 Piracy games

A few studies investigated digital pirates’ behavior using abstract laboratory games, capturing selected features of the dilemmas faced by a potential infringer. Importantly, none of them (to the best of our knowledge) focused on the issue of (conditional) cooperation between pirates, although

⁴See: “Application Usage & Threat Report”, Palo Alto Networks. URL: <http://researchcenter.paloaltonetworks.com/app-usage-risk-report-visualization/>

they did consider social impact on individual behavior. For example, Hashim et al. (2011) constructed a multi-threshold public good game, in which they examined the impact of information targeting on coordination on the cooperative equilibrium. In conclusion they suggested that an action against Internet piracy, such as marketing campaign, should not be aimed broadly at general population, because eventually it will only promote the ‘everybody else is doing it, so maybe it is OK?’ attitude.

By contrast, Hashim et al. (2013) used a more framed context, although no actual consumption of culture products was involved. In their design, following Varian and Ginkō (1999), digital content was considered as a public good, and infringing - as free-riding. They developed experimental design which involved a volunteer’s dilemma game and observed willingness to infringe copyrights under different conditions. In particular, they tested the impact of advice given to their teenage subjects from different sources - parents, record labels and industry regulator. Only advice from parents resulted in some reduction in piracy.

2.3 Piracy and personality

A small literature investigated personality traits characterizing digital pirates. Clearly, this research has potentially important implications. If we can better understand what psychological characteristics correlate with such deviant behaviors, we can

- better predict who will engage in piracy
- better appeal to digital pirates
- better understand how piracy is similar or different from other related behaviors (esp. minor white-collar crimes).

For example concerning the last point, white-collar crime is positively correlated with hedonism, narcissism and possibly conscientiousness (but see Collins and Schmidt, 1993), whereas negatively with behavioral self-control. Unethical academic behaviors on the Internet in turn have been found to be associated with low agreeableness, conscientiousness and emotional stability (Karim et al., 2009).

Focusing on digital piracy, Brown and MacDonald (2014) run an online survey with 261 participants, finding that pro-piracy attitudes were associated with lower honesty-humility and conscientiousness, as well as higher openness (HEXACO PI-R, Lee and Ashton, 2004). Al-Rafee and Cronan (2006) also showed that machiavellianism is associated with higher willingness of downloading, just as it was previously connected with unethical behavior in general.

In his bachelor thesis Rump (2011) studied the connection between illegal music downloading and personality traits among 132 German internet-users. To this purpose he applied a shortened version of the Big Five inventory for key personality features measurement. Although he did not find a significant connection with four of the five items, he found a negative relationship of conscientiousness with the propensity to download – the finding partially supporting that of Brown and MacDonald (2014). Moreover, Rump (2011) found that music downloaders perceive the risk of legal consequences as lower than the non-downloaders do.

Higgins (2004) in a survey with 318 college students found that individuals scoring low on trait self-control were more likely to express willingness to take make a copy of software purchased by their employer and take it for personal use.

In a survey of over 5,000 respondents, Assael (2005) sought to develop a demographic and lifestyle profile of heavy internet users. They analyzed key features of six categories of web users with, importantly, ‘Downloaders’ among them. They found that Downloaders are on average more optimistic than other responders, although no differences were found for other self-perception and social opinion items generally categorized as: self-confident/self-actualizer, socially/institutionally oriented, isolated/disconnected, environmentally oriented, risk avoider, conservative/security conscious.

2.4 Piracy and risk preference and other-regarding preference

Although fear of legal sanctions is recognized as a potential deterrent of would-be pirates, very little research has been devoted to the question if risk-averse individuals tend to abstain from

engaging into copyright infringement. If sanctions are to matter, we expect that this should indeed be observed.

Moreover, linking piracy to risk preference may potentially help us understand the large differences in its prevalence between different demographic groups. For example studies such as Hsee and Weber (1999) found the Chinese population more risk seeking than Americans. Coincidentally, various measures of Internet piracy are much higher in China than in the US (Bai and Waldfogel, 2012). Another commonly identified effect is that of higher prevalence of piracy in male internet users than their female counterparts (e.g. Chiang and Assane, 2007; Bouhnik and Deshen, 2013), which could be again possibly linked to the larger risk aversion among women (Byrnes et al., 1999).

As speculated before, the tendency to reciprocate (cooperate conditionally), is likely to encourage engaging in file-sharing networks. Likewise, altruism/efficiency seeking should trigger sharing. However, as of now, there seems to be no empirical work documenting such links.

3 Design and procedures

This section describes the design and the procedures applied during the experiment. This was a computerized laboratory experiment. Subjects were recruited from a pool of experiment volunteers registered with the University of Warsaw. As part of the invitation, the subjects were informed that they could be paid anything between 5 and 100 PLN (1.25-25 euro) for their participation.

Upon arrival participants were seated in a computer laboratory and presented with printed instructions. They were informed that they would earn a guaranteed show-up fee of 5 PLN. The instructions also explained that the experiment consisted of four parts, that one of these parts was pre-selected to determine earnings on top of the show-up fee. It was emphasized that subjects should stay focus throughout the experiment, because they did not know which part would matter. As it is standard in economic experiments, participants were not allowed to communicate or use electronic devices.

The four parts were as follows:

1. “piracy” game, in which subjects revealed their willingness to share (content over the internet) with unknown individuals
2. valuation, eliciting the individual pricing of online transfer
3. a version of Holt and Laury (2002) task to measure individual risk aversion
4. a version of Charness and Rabin (2002) task to measure social preference

The first two parts could result in subjects earning “transfer”, i.e. the right to download content from a popular file-sharing service Chomikuj.pl.⁵ It is widely known (and was specified in the instructions) that Chomikuj.pl contains millions of files, notably film, music and books. Vast majority of the most popular files are being distributed without copyright owners’ consent. The amount of transfer was expressed in gigabytes (GB).

Subjects were informed that, should a part involving transfer be selected for real payment, the amount of transfer resulting from their decisions would be allocated to their private Chomikuj.pl account at the end of the experiment and would be theirs to be used as they would see fit. Because of controversial ethical and legal stance of file sharing services tolerating copyright infringement, Parts 1 or 2 were never actually preselected to matter, so that subjects ended up with cash payments only.

The experiment was concluded with a questionnaire, in which responders provided some individual characteristics as well as revealed some of their individual behavioral patterns. The experiment was coded using zTree (Fischbacher, 2007). The instruction for each part were displayed directly before it was to start and subjects were given ample time to read the carefully. Each piece of instructions included one or more examples.

In addition to written instructions, control questions were displayed on the screen for parts 1 (“piracy” game) and 4 (social preference). In case a responder selected an incorrect answer (e.g. illogical or suboptimal in the context of presented example), the computer would inform a participant about the mistake and ask to retry, see examples in Figures A.2 and A.3 in the Appendix.

⁵Chomikuj.pl ranks as the 17th most visited website, The Pirate Bay ranks 66th, according to Alexa.com.

The instructions during the experiment would also help subjects find the correct answer, should they feel unable to complete the task (directions to relevant passages in the handed out paper instructions). In either case, the following screen provided feedback on each of the control questions, urging the subjects to seek experimenter’s help if they had any remaining doubts (in no case did they make use of this option).

In the reminder of this section we describe in detail each of the experimental parts.

3.1 “Piracy” Game

This part built upon the most common way of operationalizing dilemmas of conditional cooperation in experimental economics, namely the public good games (aka the voluntary contribution mechanism). Subjects were randomly and anonymously matched into groups of four. They were informed that the final outcome will depend on their decisions as well as the decisions of other team members. They were endowed with 10 PLN and could spend any amount up to that limit on “downloading” and “sharing”. The price of 1 GB was .5 PLN in either case, so that they could e.g. download 10 GB, share 5 GB and keep 2.50 PLN in cash. Each GB downloaded by a subject would mean increasing the amount of transfer allocated to this subject’s *chomikuj.pl* account (should Part 1 be played out for real). Likewise, sharing 1 GB would mean that the account of each of the other group member would be topped with 1 GB.

Similar to the study by Fischbacher et al. (2001), individuals would make both unconditional and conditional sharing decisions. Unconditional decisions had to be made without any knowledge or reference to what other group members could be doing. Conditional decisions were choices contingent on approximately how much other group members were sharing on average, see Figure A.4 in the Appendix. Thus for example reciprocal players could share more if they knew that others were also sharing. To assist the subjects, the screen with the conditional decisions was equipped with a calculator, so that subjects could see how their individual conditional choices would translate to monetary payment and transfer within the hosting services.

The instruction informed participants that if this part was selected for real payments, three unconditional decisions in each group would be implemented, as well as conditional choice of the fourth member, contingent upon the (approximate) realized average contribution of these three group mates. Thus participants were aware that any of their decisions could matter. As use of the file hosting services for the copyrighted content is ethically controversial, we set the probability of selecting this part of the experiment to zero.

3.2 Valuation

In this part the subjects were informed that they could choose between cash and *Chomikuj.pl* transfer. They were told that 1 GB, when purchased from the service, would normally cost between 1 and 1.85 PLN (the price depending on the amount purchased). They were also informed how much transfer was needed for typical downloads (e.g. a movie, a movie in HD version, etc.).

For each amount ranging from 0 PLN to 16 PLN,⁶ in steps of 4 PLN subjects were asked to indicate whether they preferred this amount or rather 10GB of transfer (or were indifferent). These choices were listed in a table, see Figure A.5 in the Appendix. If the preferences switched between cash/transfer without indication of indifference in between (e.g. transfer in rows 1 and 2, cash in rows 3-5), a second table would appear with prices ranging from the cash payment in the last row in which subject preferred transfer and cash payment in the first row in which she preferred money (4-8 PLN in the case of switching between rows 2 and 3). In this way the closest possible cash value equivalent of the transfer was established. Such a mechanism is sometimes referred to as Iterated Multiple Price List. Analogous decisions for 20GB of transfers (and valuations up to 32 PLN) were then elicited.

The participants were informed that if this part determines their payments, the computer will randomly select the amount of transfer (10 or 20 GB) and amount in cash from the appropriate range and then allocate to the subjects the outcome (transfer or cash) that was revealed preferred by them. In case responders reported indifference, the actual reward was to be randomly selected from the two. Similar to the public goods game, we set the probability of selecting this part of the experiment to zero.

⁶The choice of upper boundary was dictated by the regular price range on *Chomikuj.pl*.

3.3 Risk aversion

In this part we implemented the well-known design by Holt and Laury (2002).⁷ Participants were faced with a series of 10 lottery pairs. Each lottery pair comprised a relatively more risky lottery and a relatively less risky one. Participants were asked to choose a preferred lottery in each pair. Subjects were informed that if this part is selected to determine their payments, the computer will randomly choose one of the ten pairs and then execute the subject's preferred lottery.

3.4 Social preference

The design of this part was based on the earlier work of Charness and Rabin (2002) and involved 4 trial and 22 regular rounds of simple two-person games (played using the strategy method (Selten, 1965) whenever relevant). For example, in the game shown in Figure A.1, person A can choose "out" securing 750 for herself or let person B choose between (375, 750) and (400, 400). Thus subjects' choices can reveal other-regarding motives such as altruism, inequity-aversion or reciprocity, the relative strength of which can be assessed using a simple logit model, see Charness and Rabin (2002) for details.

A major modification comparing to Charness and Rabin (2002) was that we used the Double Response method, under which subjects had incentives both to indicate their initial, intuitive choice as quickly as possible *and* to revise if longer deliberation led them to believe the other option was preferred, see (Dyrkacz and Krawczyk, in preparation) for exposition of the method.

3.5 Ex post questionnaire

After completing the final part of the experiment, the participants were asked to fill in a short questionnaire. First, we inquired about basic information on each of the subjects, e.g. information on age, gender, education (with the field of study), year of studies and size of place of residence. We have also inquired about subjects' perceived financial situation:

Which of the below best describes your finances:

- I can afford some luxury.
- I can afford to finance my needs without much liquidity issues.
- I can afford my every day expenditures, but I need to make precautionary savings for bigger expenses.
- I need to be careful about my every day expenditures.
- I cannot afford my every day expenditures.

Second, we have also asked the subjects about their sharing and downloading behaviors. There were three separate questions for sharing, downloading from illegitimate sources and downloading from legitimate sources.⁸ In each of the questions the responders were asked to indicate how frequently they pursue the activity, with one of the three possible answers to choose from: (i) never, (ii) from time to time, (iii) frequently.

Third, the well-known Big-Five personality scale was administered, see Goldberg (1981). Due to time constraints⁹ we have applied the ten-item inventory (the so-called TIPI-P) developed by Gosling et al. (2003) and translated by Laguna et al. (2014)¹⁰, which has been tested and proved to provide measures of the five dimensions with little loss in accuracy in comparison with the longer, popular Big Five inventories, such as NEO PI-R (240 items), NEO-FFI (60 items), or the Big Five Inventory (44 items).

⁷See Dohmen et al. (2011) for the recent discussion of the alternatives.

⁸We gave subjects some examples of the most popular websites within each category.

⁹The subjects were likely to be tired after 1.5 hours of the experiment, and a longer questionnaire could yield poor quality results

¹⁰Both versions are available at Samuel Gosling's website: <http://gosling.psy.utexas.edu/scales-weve-developed/ten-item-personality-measure-tipi/>

3.6 Procedures

The experiment was run in 13 sessions, between January 24 and March 19 of 2015. It was computerized using zTree (Fischbacher, 2007). On average the experiment lasted about 100 minutes (including time for instructions reading and payments). There were 212 participants in total.

4 Descriptive analysis

Self-reported downloading and sharing behaviors constitute a starting point for exploration of our analysis. Their levels are reported in Table 1. As can be seen, there are some clear demarcation lines. The most evident subgroup consists of 26 individuals who report to never download and never upload content online. We refer to this group as **non-pirates**. Second, there are individuals, who download but never upload. In this subgroup we identify 127 downloaders who only do it from time to time (**occasional leechers**) and 19 **frequent leechers**. Finally, a group of 40 individuals report uploading sometimes or frequently. They thus, contrary to the other groups, admit to breaking the law, albeit they may be unaware of that. We refer to this group as **seeders**.

Table 1: Self-reported “piracy” behavior – frequency of downloading (from unauthorized sources) and sharing.

Self-reported sharing content online:	Downloading content online:			Total
	<i>Never</i>	<i>Sometimes</i>	<i>Often</i>	
<i>Never</i>	26	127	19	172
<i>Sometimes</i>	0	17	16	33
<i>Often</i>	0	2	5	7
Total	26	146	40	212

Table 2: Demographic and income characteristics of the sample

	Non pirates	Occasional leechers	Frequent leechers	Seeders	Kruskal-Wallis <i>p-value</i>	Total
Female	54%	65%	42%	45%	0.07	58%
Age	24.77	24.06	22.58	23.75	0.11	23.95
Student	67%	77%	100%	85%	0.04	79%
Wealth:					0.92	
1. <i>luxury</i>	8%	2%	0%	3%		3%
2. <i>all needs</i>	15%	19%	26%	20%		19%
3. <i>daily needs</i>	69%	68%	53%	68%		67%
4. <i>careful</i>	8%	10%	16%	10%		10%
5. <i>not even daily needs</i>	0%	2%	5%	0%		1%

Notes: The wealth categories here are shortened for brevity – for full versions (as they appeared in the questionnaire) see Section 3.5. 1. Can afford some luxury, 2. Can afford all the needs, 3. Can afford daily needs but has to save for expensive purchases, 4. Carefull about all purchases, 5. Cannot afford daily needs. For the Kruskal-Wallis test we report the *p – value* for a null hypothesis that all four groups are drawn from the same population.

Table 2 provides demographics characteristics of these four groups. Around 80% of the participants were students at the time of the experiment (about half of which majored in economics). In the experiment we also managed to obtain a fairly gender-balanced sample, with 58% of participants being females. Similar to some earlier evidence, women were more likely to be categorized as non-pirates or occasional leechers, see Sims et al. (1996).

Since regular downloading of content from the Internet is justified by the users as being the only way to acquire it in view of financial constraints, the questionnaire comprised also questions about income status of the subject’s household. Roughly 20% of them believed they could afford to buy whatever they needed, so we should not consider them financially constrained. Additionally, about 67% reported the need to save for more costly purchases, but ease with daily expenditures. Finally, only about 11% of the sample self-reported being financially constrained (categories 4 and

5), whereas among frequent leechers this share stood at 21%. Note that financial constraints can be directly relevant for downloading behavior, but probably not for sharing behavior. However, extensive experience in downloading can make it more likely that one also becomes a seeder. Still, empirically we see hint that self-reported seeders may be more financially constrained than the rest of the sample. We now turn to behavioral measures elicited during the experiment.

Table 3: Individual characteristics by self-reported categories

	Non pirates	Occasional leechers	Frequent leechers	Seeders	Kruskal-Wallis $p - value$	Total
Risk attitude:					0.99	
<i>Risk loving</i>	8%	12%	10%	10%		11%
<i>Risk neutral</i>	15%	13%	16%	13%		13%
<i>Risk averse</i>	77%	76%	74%	77%		76%
Other regarding preferences:	median values					
<i>when ahead</i>	-0.13	-0.07	-0.17	-0.19	0.67	-0.06
<i>when behind</i>	0.16	0.21	0.06	0.28	0.39	0.19
Reciprocity	-0.46	-0.16	-0.34	0.03	0.06	-0.17
Participants	26	127	19	40	-	212

Notes: The risk attitude assessment is based on the method and categorization of Holt and Laury (2002). The inequality aversion and reciprocity measures are based on the work of Charness and Rabin (2002). For the Kruskal-Wallis test we report the $p - value$ for a null hypothesis that all four groups are drawn from the same population.

Preferences towards the other. We follow closely Charness and Rabin (2002), estimating the model of social preferences: $U_B(\pi_A, \pi_B) \equiv (\rho \cdot r + \sigma \cdot s + \theta \cdot q) \cdot \pi_A + (1 - \rho \cdot r - \sigma \cdot s - \theta \cdot q) \cdot \pi_B$, where $r = 1$ if $\pi_B > \pi_A$, and $r = 0$ otherwise; $s = 1$ if $\pi_B < \pi_A$, and $s = 0$ otherwise and finally $q = -1$ if A has misbehaved, and $q = 0$ otherwise. The within-individual logistic regressions allow to estimate the parameters θ , σ and ρ , to identify reciprocity, aversion to being behind and aversion to being ahead, respectively.

Table 3 reports the median across individuals from the within-individual estimates. We find a possible difference between the self-reported behavior groups for the reciprocity measure – as indicated by the Kruskal-Wallis statistic. The difference is in fact in line with intuition – with a slightly higher reciprocity parameter for the seeders.

Risk attitude. We find no evidence that the attitude towards risk differentiates the self-reported behavior. The measure of risk aversion is obtained on a 10-point scale, which can be collapsed to three major categories: risk-averse, risk-neutral and risk-loving. Clearly, the share of each category is the same for all groups formed on the self-reported behavior, see Table C.1. This general observation is confirmed by the Kruskal-Wallis statistic, which fails to reject the null hypothesis.

The Big5. In Figure 1 we report the basic descriptive psychological characteristics of our sample, relative to the population in general following Laguna et al. (2014). Clearly, our population is not the same as the population in general. For the occasional leechers in the case of extraversion and emotional stability the values exceed means for the standard sample, whereas they are substantially smaller for openness and agreeableness. For the seeders, openness and conscientiousness are substantially higher than in the general population. Frequent leechers, conversely, exhibit much lower level of extraversion than the population at large or any of other groups. Being more extravert, they score also extremely high on the openness score. In terms of emotional stability, all groups seem to record higher values than the population in general, so it should rather be attributed to the sample composition – students – than to attitude towards sharing and downloading content *per se*.

Interestingly, the group of non-pirates and of the occasional leechers are different from the population at large and from one another on all accounts. While majority of adult individuals engage into leeching at best rarely – with the wide availability of other entertainments – one would expect the non-pirates to exhibit similar psychological characteristics as the occasional leechers, and both of these groups to be similar to population at large. This is not confirmed in our study. The

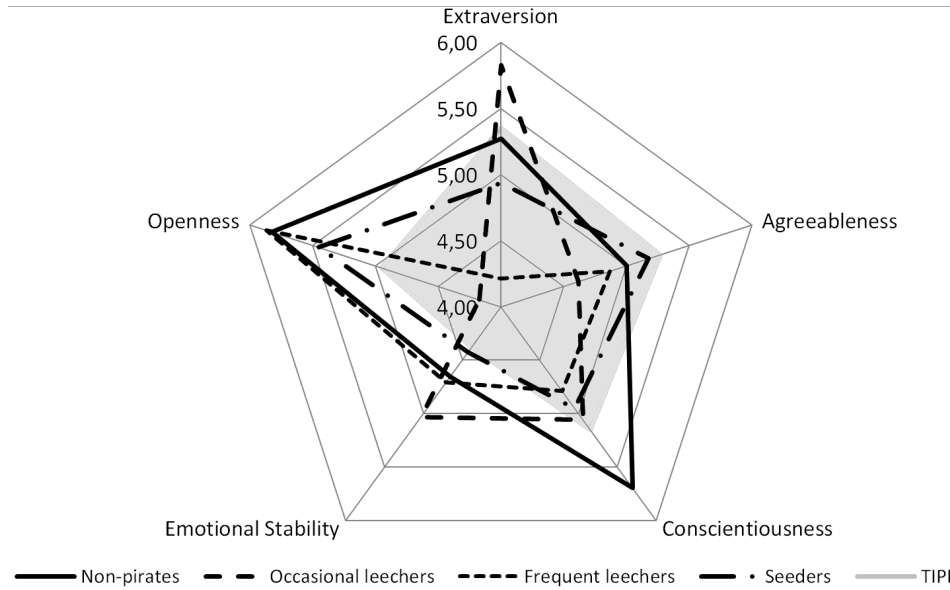


Figure 1: Comparison of our results of the Big Five measures – by ‘piracy’ groups – and the results of the Polish translation (Laguna et al., 2014) of the original TIPI (Gosling et al., 2003).

non-pirates, score lower on emotional stability and agreeableness and higher on all other accounts, especially on openness and conscientiousness. The occasional leechers, as suggested earlier, are more extravert and have higher scores on emotional stability, but – similarly to non-pirates – have lower levels of agreeableness. Unlike non-pirates, however, they score very low on conscientiousness and extremely low on openness.

4.1 The valuation and unconditional sharing decisions

Recall that the second part of the experiment rounds involved choices between cash reward and a pre-paid transfer coupon. One should anticipate that non-pirates expect no utility from the transfer, thus should exhibit the lowest valuation, followed by occasional leechers and frequent leechers. Seeders may be expected to know the market value of 1GB very well, thus showing relatively less variance in the answers. Figure C.1 demonstrates the kernel density estimators for the actual distributions, confirming broadly these intuitions. The distribution for the non-pirates is most to the left and relatively compressed. Frequent leechers valuations are characterized by a higher dispersion, with mean relatively similar to the other downloading groups. Notwithstanding, in general there seem to be no large differences between the groups.

A formal test of this statement is presented in Table 4, where we report the averages for all four groups as well as the Kruskal-Wallis test for the hypothesis that all four samples were drawn from the same distribution.¹¹ It seems that non-pirates have a somewhat lower valuation, think on average that people share and download more than those, who actually have experience in downloading or uploading content, but these differences are not large. In fact, we never reject the null hypothesis.

A possible reason for this is that subject might misreport their behavior so that our categorization into non-pirates, leechers and seeders may be flawed. At any rate however, those who admit to unlawful behavior (seeders) are correctly classified, and a large fraction of the others are also probably truthful. Yet, even self-reported seeders do not seem to differ from other groups. It is also thinkable that some leechers typically use P2P networks free of charge, so they do not need transfer on chomikuj.pl

4.2 The Piracy Game

In their analysis of reciprocity, Fischbacher et al. (2001) run a separate regression for each subject to explore how willingness to contribute depend on others’ contributions. By contrast, we only

¹¹In the Appendix C we also display kernel density estimators for the remaining variables of Table 4.

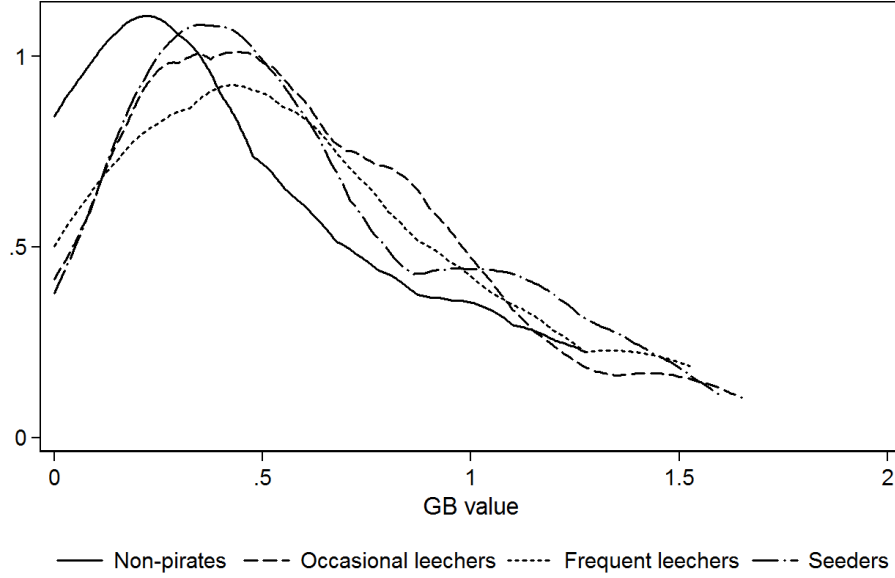


Figure 2: Kernel density estimator for the valuation of 1GB of content download in PLN, categories as in Table 1

Table 4: “Piracy”-related measures, averaged for self-reported behaviour categories

	Non pirates	Occasional leechers	Frequent leechers	Seeders	Kruskal-Wallis $p - value$	Total
GB valuation	0.42	0.58	0.57	0.59	0.19	0.56
Unconditional decisions						
download (GB)	2.34	3.72	3.00	3.83	0.18	3.51
share (GB)	1.39	2.91	3.74	2.90	0.20	2.80
Belief about sharing	4.12	4.10	3.74	3.95	0.70	4.04
Participants	26	127	19	40	-	212

Notes: GB valuation is the average amount of money respondents were willing to pay for 1GB on Chomikuj.pl. Unconditional decision to download and share refer to the variant of the piracy game when the sharing decisions of the others are not know. Belief about sharing is the belief on how much GBs the others will share with the group. For the Kruskal-Wallis test we report the $p - value$ for a null hypothesis that all four groups are drawn from the same population.

have six observations per individual (else the number of choices would be overwhelming, given that subjects had to decide about sharing *and* downloading). This limits the statistical quality and the number of possible parameters to be estimated. Thus in our OLS regressions explaining the sharing decision we only include the constant and others’ sharing as explanatory variables (and not sharing squared). The three resulting (distinct) groups are:

1. **free riders** – the subjects who shared nothing or nearly nothing, no matter the behavior of others (i.e. insignificant estimates of the slope and the constant).
2. **unconditional cooperators** – the subjects sharing a fairly constant, positive amount of GBs, irrespectively of the decisions by the others (i.e. significant positive estimate of a constant and insignificant estimate of the slope).
3. **conditional cooperators** – the subjects whose sharing was related to the sharing of the others (the estimate of the slope positive and significant, whatever the constant).¹²

Given the small sample size, we considered a parameter significant if the p -value was below 0.1. With this criterion, there is a group of individuals, who share some content, but often their sharing decisions seem to follow an erratic patten, which yields a statistically insignificant constant. While in our preferred specification we would classify these individuals as free riders, we do acknowledge that possibly with a larger number of recorded choices per subjects, the estimates of their sharing behavior would *not* be a statistical 0. Thus, we also propose the second classification, where free riders are classified based on strictly zero sharing decisions, whereas the fourth **others** comprise the group with insignificant estimates but non-zero sharing decisions. We report both classifications in Table 5.

Table 5: Piracy Game categories by self-reported behaviour.

	Non pirates	Occasional leechers	Frequent leechers	Seeders	Total
	Preferred categorization				
Conditional cooperators	38%	49%	47%	54%	48%
Unconditional cooperators	8%	14%	0%	5%	10%
Free riders	54%	37%	53%	41%	42%
Total	26	125	19	39	209

Notes: Classification based on the estimates in the regression for the reported sharing conditional on the amount shared by other group members, following Fischbacher et al. (2001), see the main text for details. A separate classification (4-level) is reported in the Appendix B.

The results of our Piracy Game are consistent with the findings of Fischbacher et al. (2001): similar share of participants fall into the category of free-riders and a share of conditional cooperators is only slightly smaller. This suggests that the “piracy” set up of the experiment does not make this case distinctive from other potential framings.

5 Regression analyses

This section presents the results for the two hypotheses formulated earlier. First, we analyze the experimental evidence on the propensity to share content online, conditional on the sharing decisions of the others in the group. We thus address the effect of group on the willingness to share. Second we explore the role of self-reported “piracy” behavior, demographics, risk aversion, other regarding preferences and the psychological characteristics on the valuation of download and upload as well as the decisions to seed and leech elicited during the “piracy game”.

¹²To maintain similarity to Fischbacher et al. (2001) we run also a specification where we include a squared term. In some cases the hump-shaped pattern was confirmed among the cooperators and in no case was the potential hump-shape responsible for the insignificance of slope. The results for the non-linearities available upon request.

5.1 The effects of group

Our main objective in this study is to inquire the effect of the group on the sharing behavior. In the experiment we elicit individual decisions about sharing content online, conditional on what they think is the overall amount of content shared by the group. Due to the experimental design, these preferences can be identified as the propensity to share. Taking these propensities at their face value, we estimate a marginal effect of 1GB shared by the others on individual willingness to share. More importantly, we test if this relationship is robust to the inclusion of other controls such as self-reported piracy behavior, attitudes towards risk, other regarding preferences, personality and valuation. In line with the high fraction of conditional cooperators reported before, we find that sharing is strongly affected by others' behavior. The estimated coefficient is extremely robust at .32-.33, implying that for each 1GB of received data (equivalent to roughly one movie), our subjects were willing to share a third of it (equivalent to roughly one episode of a TV series).

Table 6: Tobit regressions of conditional sharing on sharing of others and controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharing of others	0.32*** (0.03)	0.33*** (0.03)	0.33*** (0.03)	0.33*** (0.03)	0.32*** (0.03)	0.32*** (0.03)	0.32*** (0.03)	0.32*** (0.03)
Controls		Demo.	Piracy cat. + demo.	Risk att. + demo.	Pref-s + demo.	Big5 + demo.	GB value + demo.	All
# observations	1,272	1,242	1,242	1,242	1,242	1,242	1,242	1,242
# participants	212	207	207	207	207	207	207	207
% 0 GB	40.5	40.6	40.6	40.6	40.6	40.6	40.6	40.6
Pseudo R ²	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.07

Notes: Standard errors clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. We report the share of cases (question x individual) where the conditional sharing was reported at 0GB. Lower number of individuals in columns (2) to (8) comes from the fact that 6 individuals did not report their demographic characteristics. Full results reported in Table D.2 in the Appendix.

The results reported in Table 6 reveal as well that majority of this result comes from within subject variation in the propensity to share. In fact, given that all other indicators are available on per subject basis, the fact that the coefficient is not susceptible to the inclusion of other controls, suggests the phenomenon is not driven by some individual qualities or characteristics but indeed by the effects of the group. We test this premise explicitly in Table D.3 in the Appendix, where we explore only between subject variation. In fact, there seems to be no *constant* effect of group on the propensity to share, as including individual characteristics eliminates the significance of the estimated group effect. In the subsequent section we explore further the role of individual characteristics on the elicited propensity to seed and leech.

5.2 The profile of a “pirate”

In Section 4 we show that stratified on self-reported “piracy” behavior the individual characteristics do not seem to differ substantially between occasional leechers, frequent leechers, seeders and non-pirates. It is our objective in this section to inquire if the same holds for the elicited propensity to share and valuation of download. In the “piracy” game, we aimed at eliciting unconditional and conditional sharing decisions, similar to Fischbacher et al. (2001) we are able to explore the answers provided by the participants to the questions in each of the stages of the experiment.

We provide the results for two types of analyses. First, we test if at all the willingness to share – conditionally or unconditionally – may be related to personal characteristics. To this end we estimate a probit based on the classifications reported in Table 5. To test the robustness of this result, we also present the results for a classification reported in Table B.1, i.e. when the group with unsystematic sharing behavior is dropped from the estimations. We report the results in Table 7. We find that self-reported behavior is a poor predictor of the game outcomes – even those who admit to be frequent leechers do not seem to have higher willingness to participate cooperatively. Also other-regarding preferences have no predictive power – although in the full sample aversion to being left behind seems significant and with a positive sign, this estimate is not robust to the exclusion of free riders. However, we do find some evidence that risk loving is associated with more

cooperation, and so is emotional stability, while thoroughness and attentiveness seem to have the opposite effect.

Although there is little explanatory power in the psychological and social traits, the results of the valuation game and the “piracy” game are highly correlated. This suggest that “pirates” are not characterized by specific characteristics, but value highly the ability to acquire cultural content online. This result is crucial for policy implications, since a negative correlation would suggest that cooperation in online file sharing communities is associated with *lower* willingness to pay for cultural content. Indeed, the conventional wisdom claims that “pirates” share the files becaues they do not want to pay for authorized access. Instead, our evidence seems to suggest that more cooperative participants are willing to pay more for the ability to access their favorite music of films online.

Table 7: Probit regressions for cooperation in the Piracy Game

	Full sample	Only systematic behaviour
Piracy categories:	Non-pirates as base	
<i>Occasional leechers</i>	0.11 (0.36)	-0.16 (0.38)
<i>Frequent leechers</i>	-0.00 (0.49)	-0.21 (0.52)
<i>Seeders</i>	-0.10 (0.42)	-0.19 (0.47)
Risk attitude:	Risk neutral as base	
<i>Risk loving</i>	0.85** (0.43)	1.64** (0.64)
<i>Risk averse</i>	0.14 (0.29)	0.16 (0.32)
Pref-s towards others:		
<i>when ahead</i>	0.30 (0.27)	0.42 (0.32)
<i>when behind</i>	0.59** (0.28)	0.32 (0.31)
Reciprocity	-0.03 (0.12)	0.01 (0.15)
Big Five (TIPI):		
<i>Extraversion</i>	-0.07 (0.09)	-0.03 (0.10)
<i>Agreeableness</i>	0.04 (0.10)	0.01 (0.11)
<i>Conscientiousness</i>	-0.15* (0.08)	-0.21** (0.09)
<i>Emotional Stability</i>	0.17* (0.09)	0.23** (0.10)
<i>Openness to Experiences</i>	-0.17 (0.11)	-0.17 (0.12)
GB value	0.97*** (0.29)	1.37*** (0.33)
Constant	2.38 (1.57)	2.61 (1.65)
# observations	173	154
Pseudo R ²	0.148	0.214

Notes: Regressions include controls for age, gender, student staus and income status (self-reported). Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1 .

Subsequently, we explore the variation in psychological traits, self-reported status as well as valuation of downloadable transfer to identify who becomes a conditional cooperator and who remains a free-rider in the “piracy” game. We do so in two variants, following Table 5 and Table B.1, i.e. we do it for all the observations and excluding those who display sharing behavior inconsistent with any systematic behavioral pattern. The results are reported in Table D.1. All estimates

are reported relative to unconditional cooperators. We find no indication that any individual characteristic is a useful predictor of joining the “pirates” community. In fact, it seems that with the exception of emotional stability, if any variable proves significant, they suggest the same sign of the relationship for both non-cooperative and cooperative behavior. While any interpretation of the null result needs to be taken with caution, it does seem to concur that “pirates” are no different from “non-pirates”, i.e. sharing files online is not an activity that invokes the notions of public good and collective action.

6 Conclusions

While majority of the literature treats passive and active “digital piracy” as one, there are important reasons not to do so. First, the act of consumption is intrinsically different from the act of production – seeking cultural online content to consume by oneself simply cannot be driven by the same motivations as the act of acquiring content and distributing it for the consumption by the others. Second, many legislations delineate legal from illegal activities exactly along the lines of acquisition and sharing, with the former being usually automatically prosecuted. In this paper we focused on identifying the characteristics which make one overcome individual passivity and – in many legislations – break the law. We developed a laboratory experiment in which participants played in a “piracy game”, similar to the public goods game as developed by Fischbacher et al. (2001). Participants also revealed their risk preference in Holt and Laury (2002) game, other-regarding preferences in Charness and Rabin (2002) game and individual characteristics in a short version of the Big Five (Gosling et al., 2003).

Relying on the conventional wisdom one would expect that more reciprocal, more altruistic, and more advantageous inequality-averse subjects will be more likely to engage in sharing. Also, more risk-averse subjects should be less likely to engage in sharing. Being disadvantages and more inequality-averse could be associated with greater expectation to receive, but lower willingness to contribute. Finally, higher levels of conscientiousness should reduce the individual willingness to engage in general in illegal activities, including sharing content online. However, our results lend no support to these results. In fact, we only find that relatively higher preference for risk is associated with greater willingness to engage cooperatively in a “piracy” game, while more thoughtful individuals are less eager to do so.

While these results may seem disappointing from both policy and scientific perspectives, they are accompanied by an important result concerning the marginal valuation of the ability to download content online. We find strong and robust evidence that entering the “piracy” game cooperatively is correlated with a higher value individuals assign to accessing cultural goods (music, films and books) from the Internet. This result implies that sharing content online is an activity undertaken by those who consume cultural goods online in higher intensities, thus obtaining relatively higher utility than those, who simply download. A clear policy implication of our study is that lowering the prices of cultural goods in legitimate distribution are likely to limit the scope of online sharing, as more frequent leechers will be satisfying their willingness to consume in authorized and thus passive modes of consumption.

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Appendix A. Design of the experiment

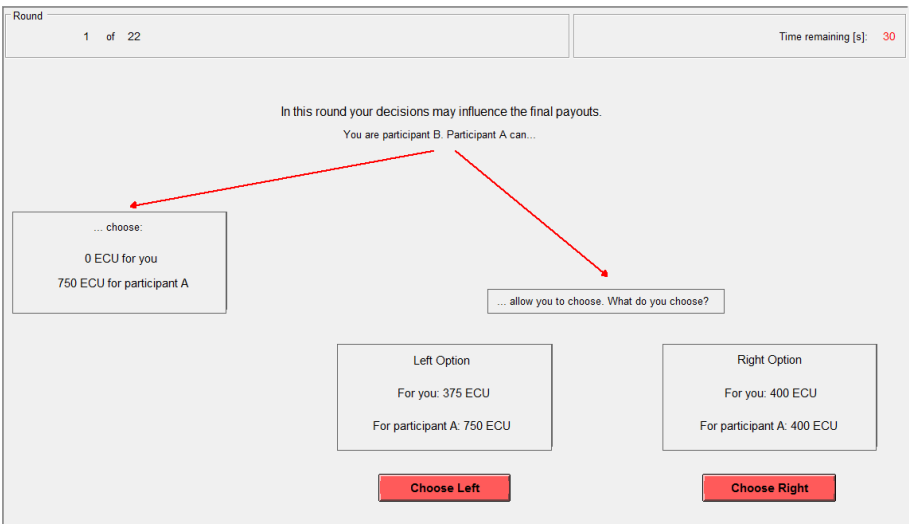


Figure A.1: Sample decision tree from part 4 (CR).

Please answer the following control questions

1. If you Download during the experiment, does it mean that you have to indicate specific files at Chomikuj.pl?
YES ☐ NO ☐

2. Do you have to make use of the received transfer immediately?
YES ☐ NO ☐

3. Suppose you decided to download 4GB and share 2GB. How much PLN will you spend?

4. Why are certain decisions named conditional decisions? Because:
☐ Previous choices affect my current options.
☐ Which of them is going to be chosen depends on the others' choices.
☐ It only means that the decision will count if this part of the experiment gets chosen.
☐ It's possible to change them later.

OK

Figure A.2: Control questions in the Piracy Game

1. If you Download during the experiment, does it mean that you have to indicate specific files at Chomikuj.pl?

ANSWER: No. If you declare Downloading and this part of the experiment gets chosen, you will receive transfer (in gigabytes) for use at Chomikuj.pl.

2. Do you have to make use of the received transfer immediately?

ANSWER: No. If this part of the experiment gets chosen and you receive transfer, you'll be free to use it whenever you like to.

3. Suppose you decided to download 4GB and share 2GB. How much PLN will you spend?

ANSWER: 3 PLN. Every GB, whether shared or downloaded, costs exactly 0.5 PLN. If you decide to buy 4GB for yourself and 2GB for the others you will spend exactly 3 PLN.

4. Why are certain decisions named conditional decisions? Because:

ANSWER: Which of them is going to be chosen depends on the others' choices. If this part of the experiment gets chosen and your conditional decision is going to be taken into account, the software will compare your declarations with those of other participants, and choose your preferred decision for such situation.

Raise your hand if you have any questions. If you do not have any questions, press "Next" and start the experiment.

Next

Figure A.3: Answers to control questions in the Piracy Game.

Conditional numbers of your shared and downloaded gigabytes.

When others share on average:	I share:	I download:	I'll have [GB]:	I'll have [PLN]:
0	0	5	5	7.5
4	3	4	16	6.5
8	6	4	28	5.0
12	9	3	39	4.0
16	12	3	51	2.5
20	15	2	62	1.5

This is the average amount shared by each of your group members

Calculate **Next**

Figure A.4: Decision screen in the Piracy Game, as presented in the printed instructions. The additional information was provided for the participants to better describe the purpose of each field, as well as to show which fields are given, and which are for the participants' input.

	Transfer	Cash	Your decision		
Choice 1	10 GB	0 PLN	Transfer	O	Cash
Choice 2	10 GB	4 PLN	Transfer	O	Cash
Choice 3	10 GB	8 PLN	Transfer	O	Cash
Choice 4	10 GB	12 PLN	Transfer	O	Cash
Choice 5	10 GB	16 PLN	Transfer	O	Cash

Figure A.5: Decisions screen in the Valuation part.

Appendix B. Four Piracy Game categories by self-reported behavior

Table B.1: Piracy Game categories by self-reported behaviour – 4 categories.

	Non pirates	Occasional leechers	Frequent leechers	Seeders	Total
Conditional cooperators	38%	49%	47%	54%	48%
Unconditional cooperators	8%	14%	0%	5%	10%
Free riders	35%	27%	37%	26%	29%
Others	19%	10%	16%	15%	13%
Total	26	125	19	39	209

Note: Classification based on the estimates in the regression for the reported sharing conditional on the amount shared by other group members, following Fischbacher et al. (2001), see the main text for details. The Free riders here include only the participants who shared exactly 0 GBs for each of the conditional choices.

Appendix C. Descriptive statistics

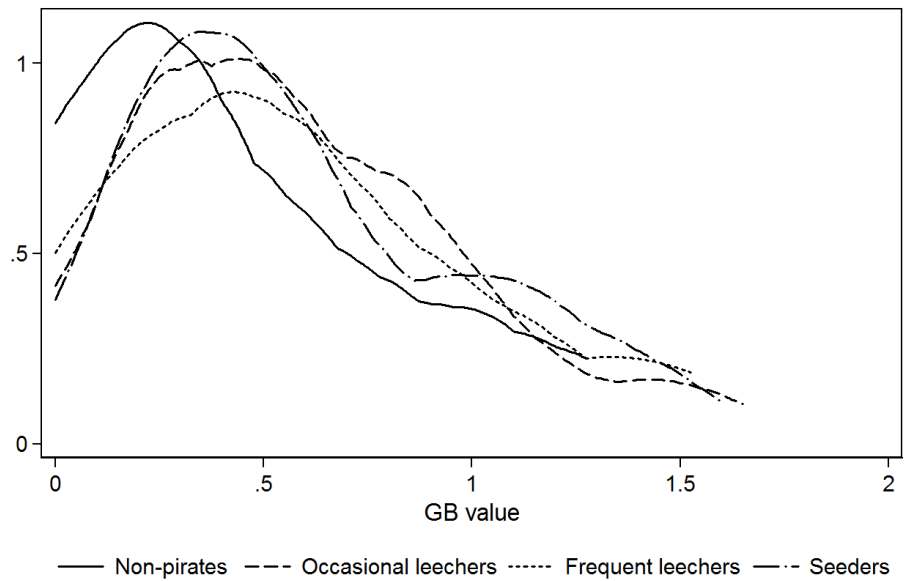


Figure C.1: Kernel density estimator for the valuation of 1GB of content download in PLN, categories as in Table 1

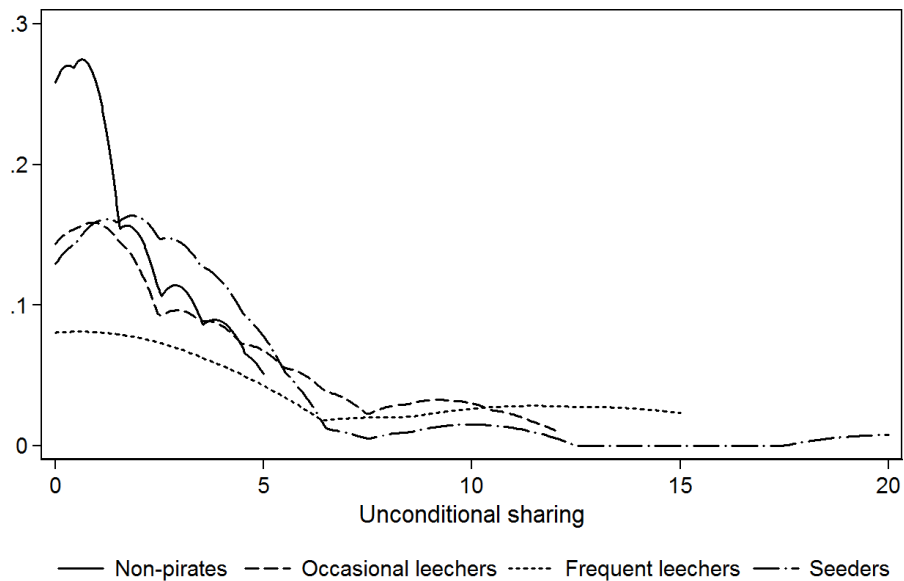


Figure C.2: Kernel density estimator for the unconditional sharing, categories as in Table 1

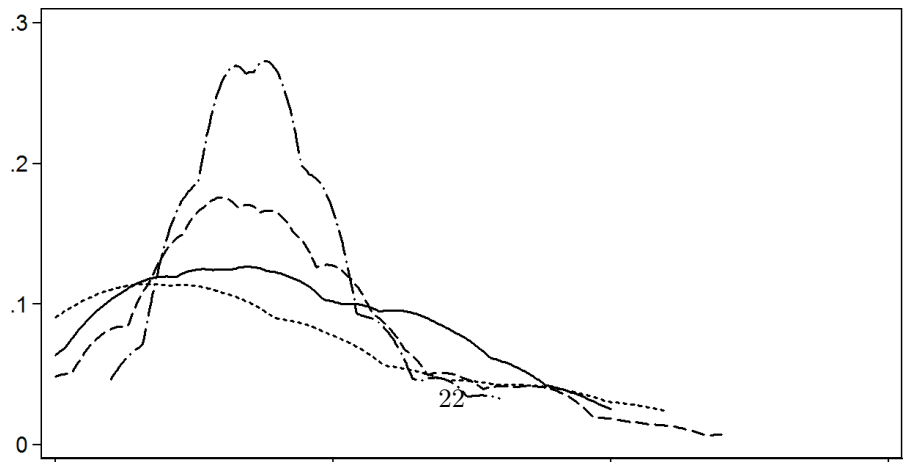


Table C.1: Kruskal-Wallis tests for the Big Five items equality between self-reported ‘piracy’ behavior categories.

	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
Kruskal-Wallis <i>p-value</i>	0.07	0.85	0.14	0.11	0.10

Notes: The compared categories are: Non-pirates, Occasional leechers, Frequent leechers and Seeders.

Appendix D. Full results of regressions

Table D.1: Mixed logit regressions of sharing behaviour

	Full sample		Only systematic behaviour	
	Cond. Coop.	Free rider	Cond. Coop.	Free rider
Piracy categories:	Non-pirates as base			
<i>Occasional leechers</i>	-15.13*** (0.62)	-15.39*** (0.49)	-15.91*** (0.97)	-15.45*** (0.91)
<i>Frequent leechers</i>	-0.14 (0.83)	-0.38 (0.85)	-0.57 (1.09)	-0.11 (1.06)
<i>Seeders</i>	0.60 (0.97)	0.40 (0.87)	0.41 (1.09)	0.64 (1.13)
Risk attitude:	Risk neutral as base			
<i>Risk loving</i>	-16.87*** (1.11)	-17.74*** (1.18)	-16.83*** (1.20)	-19.27*** (1.79)
<i>Risk averse</i>	-15.41*** (0.79)	-15.42*** (0.84)	-15.72*** (0.88)	-15.80*** (0.90)
Pref-s towards others:				
<i>when ahead</i>	-0.28 (0.96)	-0.77 (0.95)	-0.27 (0.96)	-0.76 (0.99)
<i>when behind</i>	0.35 (1.39)	-0.50 (1.36)	0.14 (1.39)	-0.31 (1.39)
Reciprocity	0.39 (0.33)	0.41 (0.35)	0.37 (0.31)	0.31 (0.40)
Big Five (TIPI):				
<i>Extraversion</i>	-0.20 (0.26)	-0.09 (0.27)	-0.20 (0.24)	-0.18 (0.26)
<i>Agreeableness</i>	-0.36 (0.37)	-0.38 (0.35)	-0.38 (0.36)	-0.37 (0.36)
<i>Conscientiousness</i>	-0.35 (0.24)	-0.09 (0.25)	-0.35 (0.24)	-0.03 (0.25)
<i>Emotional Stability</i>	0.90*** (0.34)	0.58* (0.34)	0.90*** (0.32)	0.49 (0.33)
<i>Openness to Experiences</i>	0.46 (0.32)	0.61** (0.30)	0.37 (0.30)	0.64** (0.31)
GB value	0.25 (0.79)	-1.22 (0.88)	0.17 (0.81)	-2.06** (1.04)
Constant	30.51*** (2.65)	30.31*** (2.64)	32.13*** (2.84)	31.05*** (3.05)
# observations	174	174	153	153

Notes: Regression includes variables for age, gender, being a student and wealth. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 .

Table D.2: Tobit regressions of conditional sharing on sharing of others and controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharing of others	0.32*** (0.03)	0.33*** (0.03)	0.33*** (0.03)	0.33*** (0.03)	0.32*** (0.03)	0.32*** (0.03)	0.32*** (0.03)	0.32*** (0.03)
Piracy categories:	Non-pirates as base							
<i>Occasional leechers</i>			1.82 (1.16)					1.19 (1.12)
<i>Frequent leechers</i>			0.56 (1.73)					-0.53 (1.51)
<i>Seeders</i>			1.17 (1.31)					0.05 (1.19)
Risk attitude:	Risk neutral as base							
<i>Risk loving</i>				1.49 (1.37)				2.30* (1.22)
<i>Risk averse</i>				-0.74 (1.13)				0.49 (0.92)
Pref-s towards others:								
<i>when ahead</i>					2.10** (0.94)			1.96** (0.87)
<i>when behind</i>					1.53 (0.97)			1.19 (0.81)
Reciprocity					-0.09 (0.42)			-0.05 (0.38)
Big Five (TIPI):								
<i>Extraversion</i>						0.16 (0.30)		0.20 (0.27)
<i>Agreeableness</i>						-0.23 (0.34)		-0.24 (0.30)
<i>Conscientiousness</i>						-0.59** (0.25)		-0.61*** (0.22)
<i>Emotional Stability</i>						0.70*** (0.26)		0.93*** (0.23)
<i>Openness to Experiences</i>						-0.19 (0.32)		-0.03 (0.29)
GB value							4.02*** (0.85)	4.37*** (0.83)
Constant	-1.83*** (0.38)	-0.56 (4.26)	-1.84 (4.36)	-0.89 (4.74)	-0.35 (4.24)	0.43 (5.18)	-1.36 (3.56)	-4.13 (4.55)
# observations	1,272	1,242	1,242	1,242	1,038	1,242	1,242	1,038
# participants	212	207	207	207	173	207	207	173
% 0 GB	40.5	40.6	40.6	40.6	41.0	40.6	40.6	41.0
Pseudo R ²	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.08

Notes: Regressions (2) to (8) include variables for age, gender, being a student and wealth. Standard errors clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Several individuals did not report the demographics variables – hence the decrease in the number of participants.

Table D.3: Tobit regressions of conditional sharing on sharing of others and controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	2.33***	4.25	3.01	4.11	4.95	3.51	4.42	1.14
group effects	(0.28)	(3.71)	(3.78)	(4.14)	(4.51)	(3.01)	(3.68)	(3.95)
Piracy categories:	Non-pirates as base							
<i>Occasional leechers</i>			1.56 (0.97)					1.03 (0.93)
<i>Frequent leechers</i>			0.79 (1.44)					-0.15 (1.24)
<i>Seeders</i>			1.17 (1.09)					0.27 (0.98)
Risk attitude:	Risk neutral as base							
<i>Risk loving</i>				1.09 (1.18)				1.68 (1.04)
<i>Risk averse</i>				-0.67 (0.97)				0.34 (0.78)
Pref-s towards others:								
<i>when ahead</i>					1.78** (0.77)			1.65** (0.72)
<i>when behind</i>					1.30 (0.79)			1.07 (0.66)
Reciprocity					-0.09 (0.35)			-0.05 (0.32)
Big Five (TIPI):								
<i>Extraversion</i>						0.10 (0.25)		0.14 (0.22)
<i>Agreeableness</i>						-0.21 (0.29)		-0.23 (0.25)
<i>Conscientiousness</i>						-0.51** (0.21)		-0.52*** (0.18)
<i>Emotional Stability</i>						0.57*** (0.22)		0.74*** (0.19)
<i>Openness to Experiences</i>						-0.09 (0.27)		0.06 (0.24)
GB value							3.36*** (0.71)	3.57*** (0.68)
# observations	212	207	207	207	173	207	207	173
% 0 GB	28.3	29	29	29	29	29	29	29
Pseudo R ²	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.08
Prob > F		0.95	0.88	0.62	0.10	0.21	0.00	0.00

Notes: Regressions (2) to (8) include variables for age, gender, being a student and wealth. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Several individuals did not report the demographics variables – hence the decrease in the number of participants.



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