University of Warsaw
Faculty of Economic Sciences

Working Papers
No. 25/2013 (110)

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Warsaw 2013

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Abstract

We report a laboratory experiment aimed at investigating factors affecting choice between different versions of a full-length movie. In particular, we estimate the willingness to pay for a legal, rather than pirated copy and compare it to the impact of such characteristics as picture quality or delay in delivery. We find a modest but highly significant preference for the authorized version. By conducting otherwise identical choice experiments both with and without actual experiential and monetary consequences, we conclude that the method does not seem to suffer from hypothetical bias. We also find that when the proceeds from legal sale are transferred to a good cause, willingness to pay for the unauthorized copy is reduced.

Keywords:
digital piracy, choice experiments

JEL:
D01, D12, C91

Acknowledgments:
We benefited from helpful comments by Anouar El Haji, Christian Traxler and Joanna Tyrowicz. Marta Dyrkacz provided research assistance. All errors are ours.
The project was funded by the National Science Centre grant DEC-2011/01/D/HS4/03937.

1 Introduction

Computer piracy is a hallmark of our era and one of the most controversial aspects of the process of digitalization. Broadband Internet connection has completely changed the business environment of the creative industry. Accessing infringed goods is easier than aver, fuelling fears that demand for legal copies may soon disappear. The attempts to stop this wave by technical and legal means have been only partly successful and sometimes had substantial side effects for the reputation of the industry and the welfare of even the most lawful consumers.

The key question is thus how much end-users are ready to pay to obtain legal rather than unauthorized content per se (and not because they are threatened by litigation), depending on circumstances. This has obvious direct consequences, particularly in view of the development of novel business models, based on variations of the pay-what-you-want system. In particular, it is important to deepen our understanding of how the characteristics of digital products affect our willingness to choose one or the other type.

In this study we have investigated the trade off between legality and other characteristics of the product: risk associated with copyright infringement, technical quality, immediate vs. delayed provision and, obviously, the price of the product. We have done so by observing choices between different versions of full-length movies that had real consequence. By applying choice experiment methodology, we were able to measure willingness to pay (WTP) for legal rather than illegal content as it compares to valuation of other features of the product. Additionally, we have investigated how willingness to violate copyright changes if the proceeds are known to be directed towards a good cause.

A natural way to investigate how the impact of such features compares and interacts with our main variable of interest – legal status of the copy – is to use a discrete choice experiment (DCE). In this method, the responder faces several choice sets, each containing a few alternatives. Each of them is defined by specific values of attributes of interest. This approach enables the researcher to estimate how characteristics of a product affect consumer's willingness to pay. Yet, to the best of our knowledge, choice experiments have not been used to investigate digital piracy so far.

This is somewhat surprising given that academic literature devoted to the issue has grown considerably over the recent years, implementing new methods and covering novel issues. Most studies on copyright infringement on the Internet fall into one of three general categories. The first group seeks to broaden our knowledge on impact of digital piracy on copyright holders' profits (Oberholzer-Gee and Strumpf, 2007). The second one tries to answer

the question how to effectively combat copyright infringement (Lemley and Reese, 2004).

This article belongs to the third category as it concerns behavioral aspects of software piracy. A major difficulty in this research is that using field data we seldom have the opportunity to observe entire menu of options that were available to the consumer. As a result, the models (Gopal et al., 2004) are typically verified using questionnaire data. The advantage of this approach is the ability to obtain specific information about several aspects of behavior (Al-Rafee and Cronan, 2006; Peace et al., 2003; Goles et al., 2008), often conceptualized using categories from Ajzen's (1985) Theory of Planned Behavior. Potential drawback of questionnaire data is the hypothetical nature of responders' stated preference.

The alternative is to explore preferences of consumers regarding both legal and illegal consumption of copyright goods as they show up in an incentivized experiment in the controlled, laboratory environment. Until now, this has only rarely been done. Perhaps the most closely related paper to ours is that by Maffioletti and Ramello (2004) who elicited willingness to pay for original and pirated CDs using a hypothetical question and third-price auctions respectively.[1] One feature of their design was that subjects were led to believe that the act of piracy had already been committed and the auction only determined who shall receive the resulting product. Furthermore, the product which the questionnaire concerned, was insufficiently described as "full-price CD", which might have caused some additional noise in the obtained data.

Other laboratory experiments on copyright infringement used a more abstract, stylized game. For instance, Hashim et al. (2012), following Varian and Ginkō (1999), represented digital content as a public good, and infringing - as free-riding. They developed experimental design which involved a volunteer dilemma and observed willingness to infringe copyrights under different conditions. In particular, they tested the impact of advice given to participants from different sources - parents (participants were teenagers), record label and industry regulator. The advice from parents has two alternatives - one consisted of potential punishment for parents, and other did not. Results showed that treatments which included social tie may have strong influence on purchasing behavior, but significantly less on infringing.

An important characteristic of these laboratory experiments is that they do not refer to any specific product, although it appears that attitude towards piracy and thus WTP for a legal rather than illegal copy may be grossly domain-specific. As a side note, our design could be applied to in-

[1]Thus the comparability of these two cases is limited.

vestigate consumption of other cultural goods, not only movies. The key assumption is merely that of an Internet user, who has two primary options: either obtain copy from an authorized source, or an unauthorized one. The proposed approach, while allowing the rich context of the decision typical for survey questions, makes it possible to quantify preference and additionally involves a reality check by providing the participants with incentives to choose their responses carefully. Indeed, choice modeling is based on stated preference theory which establishes a link between unobserved utility function and observed behavior. It is used to assess influence of the attributes on the 'attractiveness' of the product under consideration (Street et al., 2005).

Yet hypothetical nature of the decision task that the subject is facing may result in a bias (Murphy et al., 2005). Such hypothetical bias is likely to be larger in the case of valuing moral (or immoral) goods (Johansson-Stenman and Svedsäter, 2012). Indeed, people typically try to sustain their positive self-image and make others see them in a positive light as well (Johansson-Stenman and Svedsäter, 2012; Gilovich, 1991; Baumeister, 1998). Overreporting willingness to pay for the morally superior option may help to achieve these goals. Hypothetical choice experiments, especially those concerning sensitive questions when behavior might diverge from legal and/or ethical norm, should thus be subject to reality check. The most direct way, albeit not necessarily the easiest to implement, involves running exactly the same procedure, both with and without actual (i.a. monetary) consequences for the decision maker and whatever other parties that are involved.[2] We have decided to utilize this possibility.

Controlling for the possibility of overreporting of WTP for the legal copy due to hypothetical nature of the choice is of particular importance given the additional factor that we are investigating. Namely, we entertain the possibility that proceeds are directed to a good cause, rather than the copyright holders. This is inspired by Grolleau et al. (2008) who suggested that rather than discouraging people from consuming unauthorized files using coercive measures such as threat of litigation, it may be a good idea to increase the moral cost of pirating by framing it as an act of depriving the poor. Their results suggested that indeed moral intensity of piracy may be raised in this way, thereby limiting the prevalence of copyright infringement.[3] Our rich

[2]Hypothetical data from choice experiments has also been verified using actual market decisions (Carlsson and Martinsson, 2001; Scarpa et al., 2003) and checked for internal consistency (concordance with such assumptions as transitivity, stability and monotonicity of preference).

[3]Slightly different explanation is championed by Elfenbein and McManus (2010) who claim that people value those products that help support charities higher, probably treating them as a public good.

data set allows us to directly identify such an effect and this is indeed a result we obtain: our subjects valued the pirated product slightly less when they knew the proceeds from the legal sales would support a good cause.

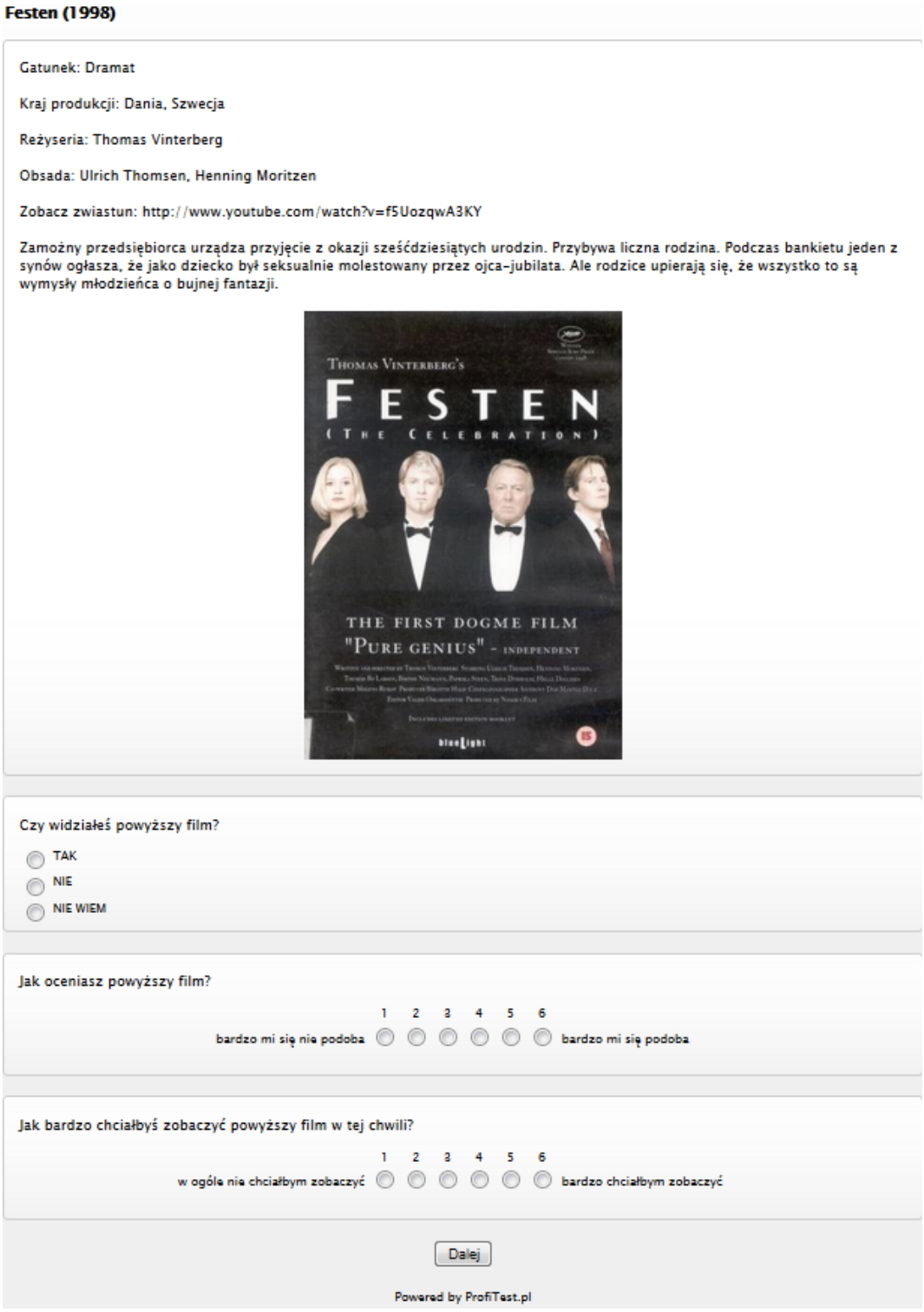
2 Design and procedures

Upon arrival, participants were seated in a computer laboratory and asked to read printed instruction. They were told they would earn 40 PLN (ca. 10 euro) for showing up on time and spending approximately 2.5 hours in the lab. They were shown a list of seven movies and asked to select the one they wanted to see during the course of the experiment. This set of movies had been carefully prepared. Our purpose was to come up with a possibly short list from which nearly everyone could pick an attractive movie for him- or herself. First, we selected 30 movies produced after year 1990 from the "TOP 250" list posted by a leading website imdb.com (with duration of each movie being between 100 and 125 minutes). We developed a web-based pilot survey showing the title, genre, year of premiere, short description and trailer of each production (see figure 1 for a screen shot). Our 49 student responders were asked to imagine they were planning to spend the following two hours watching movies and to rate each of the titles on a scale of 1 to 6, whereby 1 would indicate they did not want to see the movie at all while 6 would mean they did want to see it very much. We were able to come up with such a list of seven movies that 78% of the surveyed rated at least one of them as a 5 or 6.

Having selected the movie title, subjects of the experiment proper went on to learn about possible characteristics of the copy to be watched. These attributes are reported in Table 1. Subjects were given detailed descriptions (see Appendix) and samples.[4] They were also asked to answer a series of control questions, to make sure they understood all the attributes and the consequences of their choices.

Not all the possible combinations were used. A legal copy would always come with high quality of picture and with no penalty. Each choice set contained two alternatives of watching the movie that could differ on any of the dimensions, and the third one 'Nie ogladam niczego' ('I don't watch anything'), see Figure 2. We have included this option because in practice trade-offs between characteristics are only relevant in the domain in which the agent is willing to consume the product at all–there is little point in

[4]These can be seen here: `coin.wne.uw.edu.pl/mkrawczyk/sample_low_q.mpg`, `coin.wne.uw.edu.pl/mkrawczyk/sample_high_q.mpg`.



The three questions displayed were: have you seen this movie (yes/no/don't know)? How good do you think it is/may be? Would you like to see this movie now?

Figure 1: *Rating of a movie in the web-based pilot*

Table 1: Movie attributes

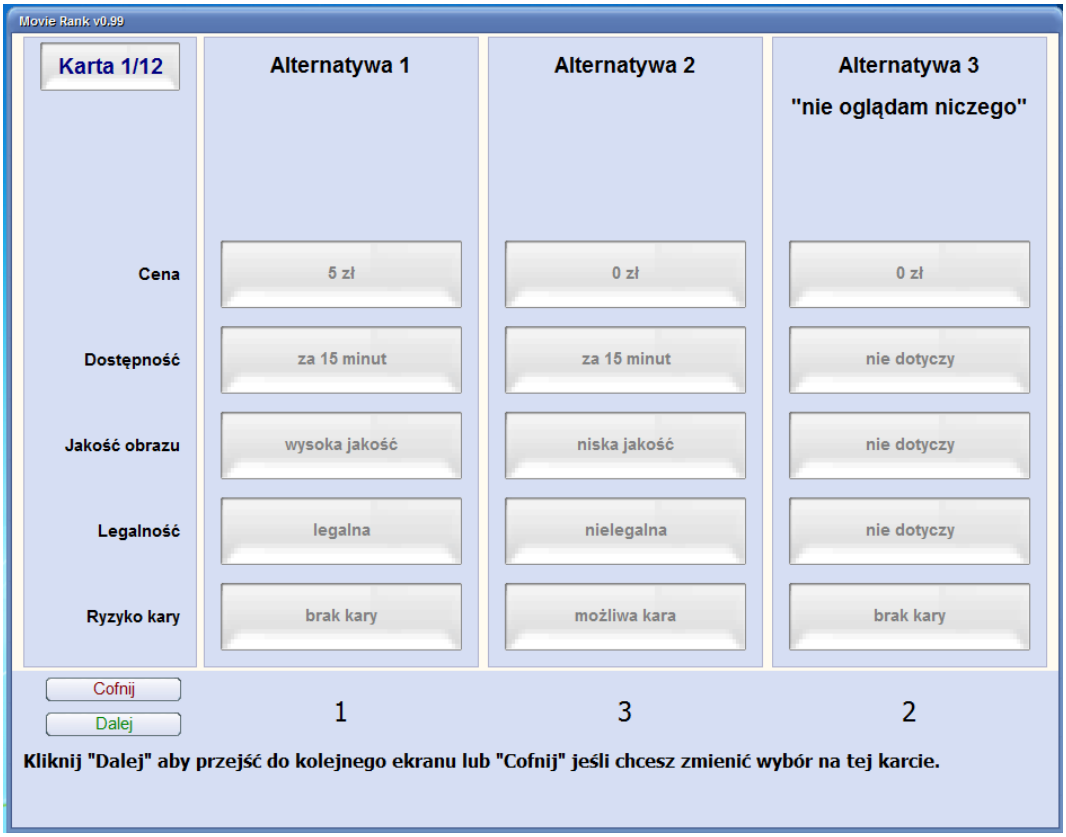
attribute	levels	description
Legality	legal	a legal copy would be used, the proceeds (price) going to the legitimate copyright holder or the Polish Film Institute
	illegal	an illegal copy would be used, the proceeds (price) going to tnttorrent.info, provider of unauthorized content
Risk	penalty	30% chance of a penalty of 25 PLN (illegal only)
	no penalty	no risk involved
Price	high	15 PLN
	medium	10 PLN
	low	5 PLN
	free	0 PLN
Picture quality	high quality	quality of a DVD copy – ca. 1800 kbps
	low quality	inferior quality – ca. 150 kbps (illegal only)
Delay	immediate	the movie was available directly following the last choice set
	delayed	the movie was available only after 15 minutes

eliciting preference between goods that are unwanted anyway.[5]

In order to maximize the amount of information, the subjects were asked to rank the options from the best to the worst (rather than simply pick what they liked most) on each of 12 choice sets.[6] In keeping with a standard procedure, we have asked the responders to iteratively indicate the most preferred alternatives in each choice set. The subjects were informed that one of the choice sets would be drawn at random and they would obtain their first-best option with probability 2/3 and their second-best option with probability 1/3. As far as we know, this is a novel, if simple, way to incentivize reported ranking of alternatives. Subjects would then spend the next approx. two

[5]Anticipating that some of our subjects may therefore end up with no movie at all, in the inviting e-mail we encouraged them to bring a book or similar form of back-up entertainment. However, we have blocked Internet access and forbade notebooks and tablets, so that subjects were not able to, e.g. watch a movie of their choice free of charge on the web. In this sense, our experiment emulated a world, in which pirated movies are not necessarily freely available but of course nobody is forced to see any movie at all.

[6]The Bayesian d-efficient design optimized for the MNL model was used to generate the specific choice sets in sessions 5-12 basing on the priors taken from sessions 1-4 in which optimal-in-difference design (Street et al., 2005; Street and Burgess, 2007) was used. This was orthogonal to treatments.



The attributes were displayed in alphabetical order in the Polish language: price, delay, quality, legality, risk. It happened to be such that what could naturally be considered as the crucial feature (price) came first, and interrelated factors (legality, quality, risk) were grouped together. In this example, the responder has already indicated that Alternative 1 was the best and is now prompted to choose the best among the two remaining alternatives.

Figure 2: *Typical choice set in the main study*

hours watching the resulting movie screened on their 15 inch LCD monitors. Sound was transferred via PC headphones which provided sufficient quality even for demanding users. Those subjects who had picked option 'I don't watch anything' were allowed to read a book or do nothing, but not to leave the laboratory before the end of the session. When all were done, a post-experiment questionnaire was displayed (see the Appendix) and payments made in cash.

In each session one of two conditions could be used. In the Baseline Condition (BC) participants were informed that the price they pay for a legal copy (if any), would be passed to the copyright owners. In the Good Cause Condition (GCC), they knew that all of the proceeds would instead be passed to The Polish Film Institute, a reputable public organization which subsidizes Polish non-commercial and commercial film projects. In either condition, any price paid for an unauthorized copy would be transferred to a pirate website tnttorrent.info. To make these statements reliable, we showed the subjects a presentation, during which we audibly and explicitly promised to send the money. After the experiment, proofs of transfers made would be displayed on the website of one of the authors.[7]

The reason for which we had indeed made these obligations was to make the consequences of paying (or pirating) in our experiment identical to those of taking such actions outside of the lab. Had we not done so, the participants could rightly perceive their decisions to contribute to watching a legal copy as solely benefiting the experimenter rather than supporting the artists and producers or any other cause.

In addition to these treatments, which we call Real (R), we have also conducted sessions under hypothetical condition (H) in which subjects were simply asked to imagine that their choices had any real consequence. In these sessions, after completing their choices, subjects proceeded to another, unrelated experiment (and were paid a fixed fee of 10 PLN plus whatever they earned in the second experiment). In this way we could make sure that the length of the R and H sessions and subjects' earnings were comparable, which also allowed us to advertise all of them in exactly the same way, so

[7]The Laboratory of Experimental Economics in Warsaw has a policy of not deceiving subjects of laboratory experiments and they are well aware of that. One of the authors has previously conducted a study with the same subject pool, which also involved a real-consequence version of a stated preference method (Krawczyk, 2012). No mistrust as to whether the transfers to an NGO promised in that study would really be made was reported and large majority of participants were willing to make non-trivial contributions. We are therefore confident that our subjects believed that the legality attribute was valid and that their choices had real consequences for the other parties as described in the instructions.

that selection could not affect treatment effects (if any).

The experiment was conducted in the Laboratory of Experimental Economics, at the Faculty of Economics, University of Warsaw in February and March 2013. The total of 228 subjects took part in the twelve sessions (three for each of the four treatments: R-BC, R-GCC, H-BC and H-GCC). Subjects were invited through the ORSEE Internet recruitment system (Greiner, 2004) from the local subject pool. Most of them were students, mean age was 23. About 55% of participants were female.

3 Modeling methodology and data analysis

3.1 Modeling methodology

Respondents to a choice experiment task are generally assumed to identify the best alternative or the preference ordering based on the relative position of the alternatives in terms of their utility levels. The best alternative is associated with the highest level of utility. The utility $\boldsymbol{U}_{nj}$ alternative j generates to individual n is described by the linear additive random utility function $\boldsymbol{U}_{nj} = \boldsymbol{\beta}'\boldsymbol{x}_{nj} + \epsilon_{nj}$ with ϵ_{nj} following an i.i.d. extreme value type I distribution. The probability of alternative i being the 'best' alternative can be described by the well-known multinomial logit model (McFadden, 1974) i.e.

$$P_{ni} = \frac{\exp(\boldsymbol{\beta}_n'\boldsymbol{x}_{ni})}{\sum_j \exp(\boldsymbol{\beta}_n'\boldsymbol{x}_{nj})}. \tag{1}$$

In addition to an MNL model the data were analyzed with a mixed logit model. Mixed logit probabilities can be expressed as the integrals of standard logit probabilities over a density of parameters. Following Train (2009) a mixed logit model (MIXL) is any model whose choice probabilities take the form

$$P_{ni} = \int \frac{\exp(\boldsymbol{\beta}_n'\boldsymbol{x}_{ni})}{\sum_j \exp(\boldsymbol{\beta}_n'\boldsymbol{x}_{nj})} \Phi(\boldsymbol{\beta}|\boldsymbol{b}, \boldsymbol{\Omega}) d\boldsymbol{\beta}, \tag{2}$$

where: $\frac{\exp(\boldsymbol{\beta}_n'\boldsymbol{x}_{ni})}{\sum_j \exp(\boldsymbol{\beta}_n'\boldsymbol{x}_{nj})}$ is a standard logit formula, $\phi(\boldsymbol{\beta}|b, \boldsymbol{\Omega})$ is the density of the random coefficients with mean $\boldsymbol{b}$ and covariance $\boldsymbol{\Omega}$.

In a standard MNL the unobserved factors that affect respondents are assumed to be independent over the repeated choices, which may be considered unrealistic in the CE exercises where respondents usually make more than one choice. There might be some unobserved factors that are constant over

the choices made by the same individual facing several choice sets, and consequently unobserved parts of the utilities over the choices may be correlated. Mixed logit models can account for dependence across repeated choices from the same respondent by specifying a panel version of the model. Conditional on $\boldsymbol{\beta}$ the probability that the decision maker n makes a sequence of T choices is the product of logit formulas, as in

$$P_{ni} = \prod_{t=1}^{T} \frac{\exp(\boldsymbol{\beta}_n' \boldsymbol{x}_{nit})}{\sum_j \exp(\boldsymbol{\beta}_n' \boldsymbol{x}_{njt})}, \tag{3}$$

where t denotes the sequence of choices made by the same respondent. Since $\boldsymbol{\beta}_n$ is not known, the unconditional probability is given by the integral over all possible values of $\boldsymbol{\beta}_n$, i.e.

$$P_{ni} = \int \prod_{t=1}^{T} \frac{\exp(\boldsymbol{\beta}_n' \boldsymbol{x}_{nit})}{\sum_j \exp(\boldsymbol{\beta}_n' \boldsymbol{x}_{njt})} \phi(\boldsymbol{\beta}|b, \boldsymbol{\Omega}) d\boldsymbol{\beta}, \tag{4}$$

with $\phi(\boldsymbol{\beta}|b, \boldsymbol{\Omega})$ being the density of a random parameter with mean b and unrestricted covariance matrix $\boldsymbol{\Omega}$. As discussed in Train and Weeks (2005) and Hess and Rose (2012), any MIXL model that allows for correlated random parameters also simultaneously allows for random scale heterogeneity across respondents, conditional on all parameters being included in this multivariate distribution. Any MIXL model that allows for correlated random parameters also simultaneously allows for random scale[8] heterogeneity across respondents, conditional on all parameters being included in this multivariate distribution.

MIXL provides much more information than MNL by allowing the user to accommodate random taste heterogeneity in the sample population. However, simply knowing that a coefficient varies across respondents is only of limited practical use. An obvious way of dealing with this issue is to move from the unconditional (i.e. sample population level) distribution to a conditional distribution. This equates to inferring the likely position of each sampled individual on the distribution of sensitivities (cf. Train (2009)). In this study we produced the conditional parameters for each individual. This enables us to compare the WTP estimates at both aggregate and individual level.

[8]Scale is inversely related to the error variance within the choice data. As such, the larger (smaller) the error variance, the smaller (larger) the parameters of the deterministic component of utility will be. It's likely that respondents vary in scale i.e. some respondents may pay more attention hence have larger scale than others. Given that it's important to estimate MIXL model with unrestricted correlation structure as such model will simultaneously allow for random variation in scale across respondents.

3.2 Data analysis

We start from presenting general results for MNL and MIXL. Looking at general results is our first validation test i.e. we test the signs and significance level of the estimated coefficients. We also calculate WTP values for the attributes. Based on these results we conclude that the results are plausible and consistent with a priori expectations and that the data at hand form a valid basis for further comparison of the treatment effects, which is the main interest of this paper. Since the conducted experiment was labeled, we start from testing whether there are systematic differences in parameter estimates between legal/illegal alternatives. A likelihood ratio (LR) test is conducted to see if a model with alternative-specific parameters outperforms a model with generic parameters. Based on the result of the LR test we estimate MIXL assuming generic specification. The MIXL is estimated to see if there is random taste heterogeneity and is later used to produce the conditional parameters for each individual. For the price coefficient, a negative lognormal distribution is used. All non-monetary coefficients are assumed to follow a normal distribution. Assuming lognormal distribution for the price coefficient is plausible from behavioral perspective i.e. restricts all respondents to have negative price sensitivity in addition this assumption guarantees that the resulting distributions of WTP are useful and meaningful i.e. have finite moments (Daly et al., 2012).

In the next step we test whether there is impact of treatment on preference estimates. We compare Real vs. Hypothetical condition and Baseline vs. Good Cause condition. In both cases the following two models are estimated: model with treatment-specific parameters and a generic model with preference parameters for both treatments restricted to be equal. LR test is then used to see if the treatment specific models outperform the generic model. All these tests are conducted within the standard MNL framework.

Apart from testing for the differences in the preference structure between treatments, we also examine the differences in Willingness-To-Pay (WTP) for the legal/illegal movie between treatments. The standard errors of WTP needed for this comparison are calculated using the Delta Method.

Implicit prices (WTP) for a marginal change in one of the attributes can be computed as marginal rate of substitution between the quantity expressed by the attribute, and income, at a constant utility level (Meijer and Rouwendal, 2006). In choice experiments the marginal rate of substitution is typically calculated with respect to minus the cost variable, which is usually included as one of the attributes characterizing alternatives (Jara-Díaz, 1991). For a linear utility function, the WTP for a certain level of attribute equals the ratio between the parameter of interest and the minus cost attribute. Taking

the ratio of two parameters, normalized using the same individual-specific scale, allows for direct comparisons of respondents' preferences.

In the last step we present summary statistics and histogram of individual level differences between WTP for legal and illegal movie. These individual level differences are produced based on the conditional parameters estimated from the MIXL model.

4 Results

The general modeling results for both MNL models (Model 1 allowing for alternative-specific parameters for attributes and Model 2 assuming generic parameters) and the MIXL model are presented in Table 2. All models were coded and estimated in NLogit.

We now proceed with a detailed analysis of the results. For all three models the signs of the main coefficients are the same and are consistent with *a priori* expectations. The estimates for alternative-specific constants for both legal and illegal copy (ASC_L and ASC_IL) are positive, indicating that respondents on average would like to watch the movie. Moreover, irrespective of the model specification, the ASC associated with the legal copy is larger than the ASC for illegal. Restricting the ASCs to be equal results in worsening the LL respectively by 2.92 units for Model 1, 6.72 for Model 2 and 27.13 for Model 3. These changes are significant at any level of confidence and indicate that watching a legal copy is associated with a higher utility level than an illegal copy. The negative and statistically significant estimates for the fixed MNL coefficients and the MIXL means for DELAY, RISK and QUAL_LOW imply that copies of the movie associated with the these attributes are less likely to be chosen. Both MNL models show negative and highly significant price sensitivity.

The comparison between the MNL models shows that allowing for the alternative-specific parameters (legal vs. illegal) does not statistically improve the MNL model fit (i.e. $LR = 0.86$, $df = 2$ implies $p = 0.65$).[9] Based on this result we estimated MIXL model assuming the generic specification. The MIXL model uses 21 additional parameters, namely the elements of the Cholesky matrix for the one log-normally (price) and five normally distributed non-cost coefficients. By allowing random taste heterogeneity and unrestricted correlation structure we obtain a huge improvement in log-likelihood by 611.1 units, which is significant at any level of confidence. This indicates that substantial random heterogeneity in tastes is present.

[9]However, it may interesting to note that disutility from waiting appears to be much higher if the copy is legal.

Table 2: Estimation results

	(1) MNL par. spec. for alternatives		(2) MNL generic parameters		(3) MIXL generic parameters	
	coeff.	t stat.	coeff.	t stat.	coeff.	t stat.
PRICE			−.12013	−17.80	−1.69505	−18.61
PRICE_L	−.11883	−13.91				
PRICE_IL	−.11925	−12.28				
DELAY			−.26107	−5.02	−.53568	−5.97
DELAY_L	−.33243	−3.57				
DELAY_IL	−.17442	−1.58				
RISK	−1.28674	−12.74	−1.27781	−13.24	−2.70595	−14.89
QUAL_LOW	−.81037	−8.06	−.80774	−8.39	−1.73760	−9.44
ASC_L	1.95760	17.82	1.93402	20.53	4.57800	16.24
ASC_IL	1.57506	12.96	1.61282	17.31	4.05232	15.26
Standard deviations						
PRICE					0.20679	13.06
DELAY					.49304	5.27
RISK					2.11295	9.51
QUAL_LOW					1.31109	5.62
ASC_L					3.30499	13.73
ASC_IL					3.24534	11.76
LL	−2643.40		−2643.83		−2032.73	
N			2736			

The calculated trade-offs for both generic models are reported in Table 3. For both models legal is on average about 3 PLN more valuable than illegal. For both models the highest negative value is associated with RISK, followed by QUAL_LOW and DELAY in the end. The estimates for RISK are somewhat higher than the expected value of the loss associated with this feature (7.5 PLN), suggesting risk aversion. The absolute mean WTP values for MIXL are larger than corresponding values for MNL. This is often the case with log-normal price coefficient (see Giergiczny et al. (2012) for detailed discussion). For this reason, in addition to the means, the medians of WTP values are reported. As can be seen, the medians of the MIXL model are very similar to the WTP values for Model 2.

We would like to underline that the generic results for both MNL and

Table 3: WTP estimates

	Model 2	Model 3		
	mean	mean	std. dev.	median
DELAY	−2.17	−2.89	2.79	−2.08
RISK	−10.64	−14.99	12.37	−11.33
QUAL_LOW	−6.72	−9.62	7.55	−7.35
ASC_L	16.10	25.46	19.09	19.76
ASC_IL	13.43	22.37	18.98	17.15

MIXL in terms of the utility and WTP estimates are in accordance with a priori expectations based on this we conclude that they form a valid basis for the further analysis (i.e. impact of the treatment effects). We now proceed with a detailed description of the treatment effects. The results of the treatment-specific models are reported in Table 4. For both treatments the baseline is Model 1.[10]

The corresponding LR tests are reported in Table 5. As can be seen in terms of preference estimates we did not identify statistical differences between R and H specific estimates. Whereas for GCC vs. BC we identify a moderate treatment effect i.e. the model with treatment specific parameters in this case outperforms Model 1 ($p = 0.08$).

In Table 6 we present the impact of different treatments in terms of WTP values. For three conditions i.e. GCC, R and H the WTP for legal is statistically larger than WTP for illegal. The only exception is BC where the difference is not statistically significant even at the 10% level. Comparing the value of the legal copy across treatments we do not find any difference. The same is true when the illegal is valued under H vs. R. However, there is a weakly significant difference in the value of the illegal version between BC and GCC: on average, respondents are willing to pay less for the pirated version when they know the money for the legal copy would go for the good cause. This is consistent with the notion that piracy carries greater moral weight when the proceeds from legal sales support a good cause, rather than are entirely consumed by a wealthy corporation.

[10]Given that we did not find significant differences between the alternative-specific model and the generic model (i.e. Model 1 vs. Model 2 in Table 2), we could use the generic model (i.e. Model 2) as the baseline model. This would, however, make the comparison of BC vs. GCC effect less clear as the baseline model would not include the illegal-specific price coefficient which necessarily needs to be present when BC/GCC specific parameters are estimated. To avoid a situation in which two different reference models are used we decided to relay, for both treatments, on the same reference model (i.e. Model 1). We only note here that the impact of treatment Hypo vs. Real does not depend whether Model 1 or 2 are used as the base.

Table 4: Impact of different treatments (preference estimates)

Real vs. Hypothetical			Baseline vs. Good Cause		
	coeff.	t-stat		coeff.	t-stat
$\text{PRICE\_L}_{\text{real}}$	−.12543	−10.34	PRICE_{CC}	−.11889	−9.94
$\text{PRICE\_IL}_{\text{real}}$	−.11939	−8.82	DELAY_{CC}	−.25249	−2.04
$\text{DELAY\_L}_{\text{real}}$	−.27412	−2.08	ASC_L_{CC}	1.98107	13.18
$\text{DELAY\_IL}_{\text{real}}$	−.23707	−1.52	PRICE_{BC}	−.11921	−9.96
$\text{RISK}_{\text{real}}$	−1.25611	−8.94	DELAY_{BC}	−.41445	−3.32
$\text{QUAL\_LOW}_{\text{real}}$	−.73211	−5.22	ASC_L_{BC}	1.93832	12.97
$\text{ASC\_L}_{\text{real}}$	2.06500	13.28	PRICE_{IL}	−.11938	−12.29
$\text{ASC\_IL}_{\text{real}}$	1.63070	9.56	DELAY_{IL}	−.17553	−1.58
$\text{PRICE\_L}_{\text{hyp}}$	−.11254	−9.33	RISK	−1.28708	−12.75
$\text{PRICE\_IL}_{\text{hyp}}$	−.11937	−8.55	QUAL	−.81070	−8.07
$\text{DELAY\_L}_{\text{hyp}}$	−.38981	−2.96	$\text{ASC\_IL}_{\text{CC}}$	1.47668	12.97
$\text{DELAY\_IL}_{\text{hyp}}$	−.11283	−.72	$\text{ASC\_IL}_{\text{BC}}$	1.6803	12.55
RISK_{hyp}	−1.31782	−9.07			
$\text{QUAL\_LOW}_{\text{hyp}}$	−.89018	−6.17			
$\text{ASC\_L}_{\text{hyp}}$	1.85363	11.93			
$\text{ASC\_IL}_{\text{hyp}}$	1.52124	8.77			
LL	−2642.23			−2639.25	
N	2736			2736	

Note: legal alternative always come with high quality of picture and with no penalty. Thus, variables RISK and QUAL_LOW are specific to illegal alternative.

An example of subjects' decisions driving this modest difference is given in Table 7, where choice set 4 of sessions 5-12 is presented. In this case, either copy (legal or illegal) would cost the same and entail no penalty. The subjects thus had to decide whether or not they wanted to trade superior quality and legal status for immediate access; else, they could altogether abstain from consumption. The figures in the last two columns show that about one-third found the latter option most attractive in either condition. There is, however a difference among those who did want to consume – a higher proportion of BC subjects than GCC subjects pointed at the unauthorized copy as their top preference (automatically, the reverse was true for the authorized copy).

To give some account for individual heterogeneity, we show summary statistics (Table 8) and cumulative distribution functions (Figure 3) of subject-level differences between WTP for a legal and illegal movie, for the two conditions that we previously found to deliver somewhat different aggregate values

Table 5: Impact of different treatments: preference estimates

	R/H	GCC/BC
LR	3.86	8.30
df	8	3
p-value	0.86	0.08

Table 6: Impact of different treatments: WTP estimates

	GCC	BC	BC-GCC	p-value	R	H	R-H	p-value
legal	16.68	16.23	0.45	0.75	16.46	16.47	-0.01	0.99
illegal	12.32	14.02	-1.70	0.06	13.65	12.74	0.91	0.56
leg-ill	4.37	2.21			2.80	3.72		
p-value	0.00	0.11			0.04	0.01		

Note: illegal estimates for no delay, high quality, no risk

(i.e. BC vs. GCC)[11]. The distributions are similar yet significantly different ($p = 0.000$ in Kolmogorov-Smirnov test), with higher mean and lower variance under GCC. The additional value of the legal copy lies within a reasonable range or $(-5, 15)$ or so for large majority of subjects.

4.1 Demographic and post-questionnaire measures

As mentioned in Section 2, we have asked a number of questions concerning attitudes towards piracy (see the Appendix). Perhaps surprisingly, these measures were found to be entirely unrelated to behavior observed in the lab, neither the hypothetical nor real conditions (details upon request). We did not observe sizable impact of demographic variables either, which is not very surprising in our rather homogeneous student subject pool.

5 Conclusion

There are a few lessons that can be drawn from our study. On the methodological level, it confirms that choice experiment methodology can be successfully used to investigate preference for authorized vs. unauthorized content in a controlled lab environment. Estimates for all the variables suggest that

[11]The individual level characteristics calculated based on the conditional parameters estimated from the MIXL model were specific to each laboratory conditions.

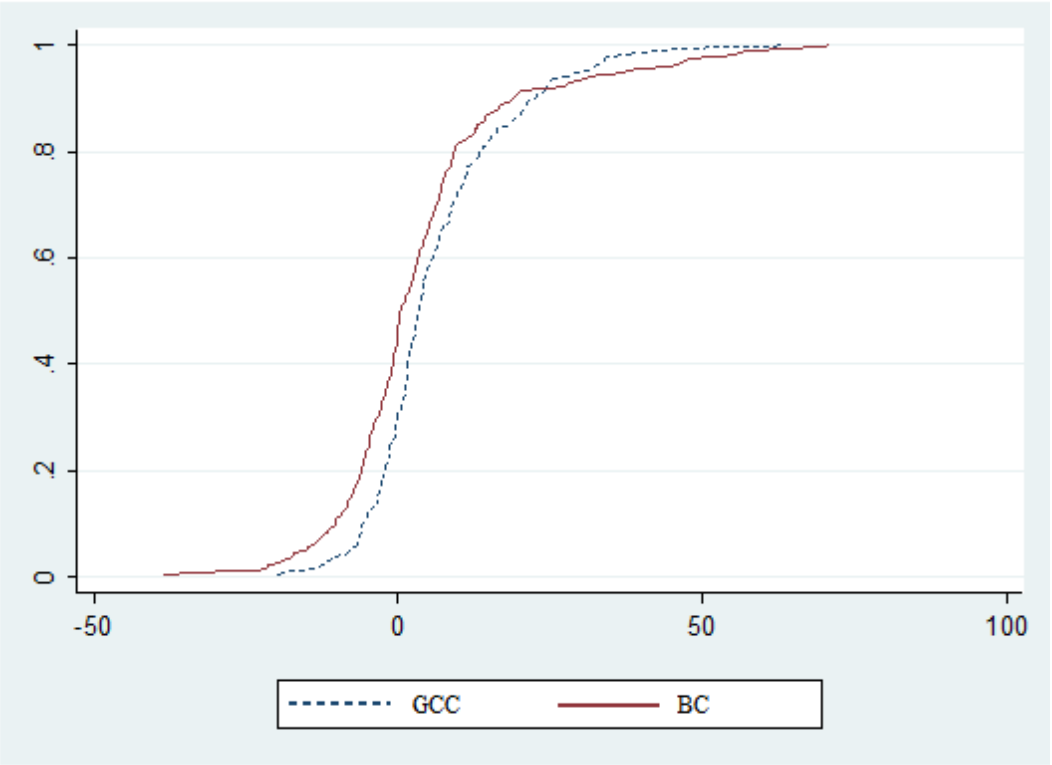


Figure 3: *Histogram of individual level characteristics*

Table 7: Treatment effects: example

alternative	price	delay	quality	risk	% top-ranked BC	% top-ranked GCC
legal	15	delayed	high	no	38.4%	49.4%
illegal	15	immediate	low	no	27.4%	13.9%
nothing	0	x	x	no	34.3%	36.7%

Table 8: summary statistics

individual WTP difference legal-illegal	Mean	Std. Dev.
BC	3.560	15.414
GCC	6.182	11.767

participants have made reasonable, thoughtful choices – negative features such as small delay in movie consumption or inferior quality made given option less likely to be chosen. The individual WTPs showed substantial heterogeneity but were in a reasonable range for most subjects. Further, we have not seen any evidence of hypothetical bias, which suggests that subsequent studies can skip the tedious procedure we went through. In other words, subjects were not particularly reluctant to admit in the hypothetical condition what they would really do if it was truly about their own money.

The other news, as far as methodology is concerned, is bad: post-experiment questionnaire measures were not linked to observed behavior. One possibility is that the survey instruments we took from extant literature are not well-suited to predicting actual actions. In other words, subjects might have their views on, say, ethical aspects of piracy that they truthfully report, yet do not necessarily take into account when facing a specific choice between forms of entertainment, as they do in their daily lives. Such a gap between norms and actions related to piracy should certainly be studied further.

More practically, our results indicate that there is a positive willingness to pay for an authorized version of the content, although it is quite low. Further, this aversion to the pirated product, however weak, is not crowded out by the threat of punishment. Similarly, participants clearly show willingness to pay for such features of the product as quality and immediate access. Thus, a carefully chosen combination of piracy prevention, suitable distribution channels and attractive pricing appears to be a viable business option for the copyright holders, even if pirated copies are widely and cheaply (freely) available.

Our data also shows that it might make a difference what happens with

the proceeds–the additional willingness to pay for the legal rather than illegal copy is slightly higher in the Good Cause Condition. Interestingly, our data allows us to establish that this effect mostly consist in lowering the value of the unauthorized version. We propose that this can be interpreted as the act of piracy gaining in moral weight when it hurts a good cause. Of course, abstaining from purchase is equally harmful in terms of missing revenue; however, nobody could reasonably be blamed for simply refusing to consume a specific product.

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Appendix: the questionnaire

Table 9: The questionnaire (part 1)

Experiment is slowly drawing to a close. Please answer a few more questions.		
Q1	How would you rate quality of the displayed movie?	very low ... very high
Q2	In general, how much did you enjoy the displayed movie?	I didn't enjoy it very much ... I enjoyed it very much
People have different opinions on downloading movies and TV shows (or watching them on-line) without authorization from and profit for the copyright owners. Such behavior is sometimes called "internet piracy".		
	[Attitudes]	
Att1	In your opinion, committing internet piracy is:	bad ... good
Att2	In your opinion, committing internet piracy is:	unpleasant ... pleasant
Att3	In your opinion, committing internet piracy is:	foolish ... wise
Att4	In your opinion, committing internet piracy is:	unattractive ... attractive
Att5	In your opinion, committing internet piracy is:	illegal ... legal
	[Subjective norms]	
Sub1	if you committed Internet piracy, most of the people who are important to you would:	disapprove ... approve
Sub2	People who are important to me think that committing Internet piracy is okay.	strongly disagree ... strongly agree

Note: Questions Att1- PBC2 were based on Peace et al. (2003) All variables have 5 levels as follows: 1 - "never/less than once per year" 2 - "1-3 times per year" 3 - "4-11 times per year" 4 - "1-3 times per month" 5 - "one/several times a week" 6 - "every day/almost every day".

Table 10: The questionnaire (part 2)

[Perceived behavioral control]		
PBC1	If I want to, I can commit Internet piracy.	strongly disagree . . . strongly agree
PBC2	Technically, for me to commit Internet piracy is:	easy . . . difficult
We would like to ask you now several questions about your movies-related habits:		
Hab1	On average, how often do you go to cinema?	1 . . . 5
Hab2	On average, how often do you buy movies on DVD or Blu-ray (also distributed as package deals with newspapers and magazines)?	1 . . . 5
Hab3	On average, how often do you watch feature-length movies on TV?	1 . . . 5
Hab4	On average, how often do you watch feature-length movies acquired from an authorized Internet source?	1 . . . 5
Hab5	On average, how often do you watch feature-length movies acquired from an unauthorized Internet source?	1 . . . 5

Note: Questions Att1- PBC2 were based on Peace et al. (2003) All variables have 5 levels as follows: 1 - "never/less than once per year" 2 - "1-3 times per year" 3 - "4-11 times per year" 4 - "1-3 times per month" 5 - "one/several times a week" 6 - "every day/almost every day".

Table 11: Personal data

sex	Gender of a subject
age	Age of a subject
acmaj	Academic major
yearof	Year of study
exp	Number of experiments in which subject previously participated
sib	Number of siblings
placeof	Size of place of residence in the age of 16
inc	Average monthly per capita income in household

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