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We all do it, but are we willing to admit? Incentivizing digital pirates' confessions

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Abstract

In this study we try to assess the prevalence of illicit downloading in the market of audio books and the willingness to admit to such practices. We compare the Bayesian Truth Serum (Prelec, 2004) treatment in which truthful responses and precise estimates are rewarded to the control treatment with a flat participation fee. We find a sizable treatment effect - incentivized "pirates" admit approximately 60% more often than the non-incentivized ones.

Keywords:
illegal download, digital piracy, Bayesian Truth Serum, wages

JEL:
A13, C93, D12

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1. Introduction

When eliciting information about prevalence of shameful activities (e.g. lying, tax evasion, drug use, criminal acts or risky sexual behaviors), researchers face the obvious problem that subjects may be unwilling to give a truthful answer. Typical psychological explanations of this phenomenon are shame and/or fear of sanctions. Is it likewise shameful to download cultural content from unauthorized sources?

Statistics show that a large part of global Internet traffic is driven by these praciticies[1]. Surveys in several countries confirm that majority of Internet users have at least once acquired books, music, movies or games from unauthorized distributors.[2] On the other hand, it has been often emphasized that social pressure is an important determinant of choice between downloading from unauthorized source (henceforth digital "piracy") and fully legitimate purchase.[3] Typically, this contention was corroborated by survey studies: people who report relatively lower propensity to acquire content from unauthorized sources declare at the same time that those, who matter to them (family, friends, role-models) do not approve of digital "piracy". In this study we introduce an innovation to this strand of research. If indeed downloading unauthorized content is something to be ashamed of, we should see higher self-admission rates when we incentivize truthful responses.

We survey a carefully selected group of Internet users, asking if they downloaded audio books from unauthorized distributors. In the control group rewards for participation are allocated randomly. In the treatment group we incentivize subjects to be honest by employing the Bayesian Truth Serum (BTS henceforth) developed by Prelec (2004)[4]. We find that incentivized individuals admit substantially more to downloading content from unauthorized sources.

2. Method

The idea behind the BTS consists of linking the (expected) value of the rewards to accuracy of the answers given by the subjects. The BTS algorithm assigns points for a correct prediction of the distribution of responses and gives more points for the responses which are "surprisingly popular". This idea is based on Bayesian inference–observing one's own answers improves predictions on the distribution of responses among other respondents. An honest answer

[1] See Schulze and Mochalski (2009)

[2] See Zhao and Keane (2013) for China, Siwek (2007) for the USA or Cox et al. (2010) for Finland, to name just a few examples.

[3] Ford and Richardson (2007) provide an overview of experimental evidence linking ethical judgment to decision-making in a more general context. Literature related directly to on line intellectual property rights infringement is discussed for example in Peace et al. (2003); Cox et al. (2010) and Oh and Teo (2010).

[4] Jurca and Faltings (2011) discuss various cases of eliciting the true distribution. Barrage and Lee (2010) discuss in detail the advantages of Bayesian Truth Serum, when compared to other methods of eliciting behavior.

increases one's chances of scoring points for a "surprisingly popular" response. Weaver and Prelec (2013) demonstrate the BTS yields significantly more honest responses in a general knowledge questionnaire even if the control group receives financial incentives as well.[5]

2.1. Subjects

The study was conducted with the help of Fonopolis Ltd., an audio book crowd-funding platform.[6] We gained access to a pool of 1000 (anonymized) subscribers. We also acquired information on whether responders have already contributed to the audio books (i.e. purchased them *ex-ante*).

The creation of an audio book does not directly hinge on contributions reaching a pre-defined target – rather the subscribers know that by contributing *ex ante* they raise the chances that the amount needed for production is collected. Consequently, subscribers of Fonopolis are on average admittedly at least as engaged in supporting culture as other Internet users.

2.2. Experimental design

We e-mailed an invitation to an on line survey to all subscribers of Fonopolis platform. We were able to generate a unique link for each subscriber, making it possible to match responses with relevant contribution/purchase data.

The pool of subscribes was divided randomly into treatment and control groups. In both cases we informed participants about the number (25 per each treatment group) and value (50 PLN = 12.5 EUR each) of prizes to be won. In the control group the invitation to the survey informed that prizes will be randomly assigned between the participants. In the treatment group participants were informed that their chances of winning would depend on how true the answers are.

> *As in all surveys, we are interested in answers as honest as possible. We thus use a method developed in 2004 by Drazen Prelec, a psychologist and mathematician from Harvard University. The method was published in the prestigious academic journal "Science". The method, on average, gives more points to those participants who answer questions truthfully. The more points you gain, the greater is your chance of winning an audio book worth 50 PLN.*

[5] In addition to questionable research practices, the BTS has been utilized in studies of optimal incentives for inexpert human raters (Shaw et al., 2011), informing policy (Weiss, 2009), questionable research practices in social sciences (John et al., 2012) as well as *ex ante* analyzes of new drug adoption (Howie et al., 2011)

[6] The platform offers the subscribers the opportunity to contribute to creating a certain audio book prior to its distribution. Subscribers contribute to the creation of an audio book by conditionally purchasing it *ex ante*. The value of the contributions, may exceed the final market price of this audio book as announced at the moment of fund raising. Contributors who pay more may chose to receive an audio book with additional attributes (e.g. a personalized dedication to the contributor by the actors reading the audio book). All productions by Fonopolis Ltd are new audio books, i.e. concern creating an audio version of the book that existed only in print.

The more thoughtful and truthful your answers, the greater the chance of winning!

2.3. Survey

Survey consisted of two screens with questions, the structure of which followed closely the design of John et al. (2012). The first screen formulated a simple question concerning the individual behavior:"Have you acquired an audio book from an unauthorized Internet source in the last month?". This is the self-admission rate. Subjects were informed that when using the phrase "unauthorized Internet source" we referred to "portals and P2P networks, which can be used to share files with other users (e.g. chomikuj.pl,[7] bitshare.com)". The second screen consisted of two questions about the behavior of the reference group.

> *The following two questions concern the behavior of customers of Fonopolis crowd-funding platform, which offers audio books.*
>
> 1. *In your opinion, what percentage of customers of Fonopolis crowd-funding platform has acquired at least one audio book from any unauthorized Internet source during the last month?*
> 2. *In your opinion, of those who did, what percentage will admit doing so?*

Thus, in addition to providing self-admission rates we have also asked responders to asses prevalence of such behavior among others (prevalence estimate) and to estimate the percentage of people who will admit to it (admission estimate). The product of the two was taken as subject's predicted fraction of admissions among all responders. Final screen collected data on age, gender, education and professional status of the responders.

The survey was sent to 693 clients of Fonopolis Ltd who have already paid for creating content and to 307 individuals who have subscribed to the service but so far have only listened to free sample chapters of audio books.[8] We received 148 complete responses in the treatment group (response rate = 29.8%) and 135 in the control group (response rate = 27%).[9] The sample is dominated by men (80% in control group and 82.5% in the treatment group), which may stem from the fact that Fonopolis specializes in fantasy literature.

[7]This is the most popular file-sharing service in Poland, according to traffic use statistics.

[8]The invitations to participate in the survey were sent out on December 17th, 2013. Those who had not answered by then, received a reminder on Jan 6, 2014. Data collection lasted for two more weeks from this reminder.

[9]The difference in response rate between the treatment and control group is not statistically significant. The response rate was slightly lower among non-contributors than among contributors (22.5% vs. 30,9%, $p < .01$.)

3. Results

The results confirm the expectation that the treatment group incentivized by BTS algorithm more often admits to illicit downloading, Table 1. The difference between the groups amounts to about two thirds and is statistically significant. Importantly, these two groups do not differ in prevalence estimates, nor admission estimates.[10] However, the treated group shows greater internal consistency in that mean prediction is closer to actual admission rate and squared prediction errors are lower. In addition to being more truthful, this group might thus have also been somewhat more thoughtful in "guessing" the admission and prevalence rates. These findings seem to confirm that incentives help to overcome shame (or perhaps fear) associated with downloading audio books from unauthorized Internet sources. While the overall admission rates and prevalence rates may seem low, the survey inquired purchase of audio books only and within a relatively short time span (past month).

Finally, we also compare contributors to non-contributors. We observe a striking interaction with treatment manipulation. Non-contributors appear to exhibit a higher true prevalence of illegal downloading but are only willing to admit when incentivized to do so, while treatment effect is nearly null among contributors. Financial constraints could be one possible justification of these findings: non-contributors may be more budget-constraint, yet still interested in consumption. They are, therefore, more likely to commit piracy and at the same time are more likely to react strongly to financial incentives in the experiment.

4. Conclusions

In this study we tested the hypothesis that downloading content from unauthorized sources constitutes a type of a deed that people are reluctant to admit to. We indeed find that self-admission rates are 60% higher in the the Bayesian Truth Serum group than in the control group with no incentives. We interpret this finding as support for using BTS in subsequent analyzes of digital "piracy". It also suggests that intellectual property rights awareness campaigns might be somewhat effective.

[10] This was to be expected – there is nothing inherently shameful about reporting beliefs concerning others' behavior.

Table 1: Comparison between the control and treatment groups

	Control	Treated	Test statistic	p-value
	Total sample			
Self-admission rate	10.4%	16.9%	-1.606[a]	0.055
Prevalence estimate	44.0%	45.9%	-0.640[b]	0.522
Admission estimate	32.0%	31.3%	-0.026[b]	0.980
Prediction[c]	15.2%	15.4%	-0.272 [b]	0.7855
	(19.1313)[f]	(18.2318)[f]		
Prediction error[d]	386.90	332.49	4.41[b]	0.000
Prediction score[e]	-0.22	-0.20	2.03[b]	0.042
Contributions (no. of times)	1.17	1.15	0.161[b]	0.872
Contributions (value in PLN)	85.09	57.17	0.558[b]	0.577
No of observations	135	148		
	Contributors			
Self-admission	9.9%	12.4%	-0.574[a]	0.567
Prevalence estimate	42.2%	43.3%	-0.296[b]	0.767
Admission estimate	32.3%	31.8%	0.123[b]	0.902
No of observations	101	113		
	Non-contributors			
Self-admission	11.8%	31.4%	-2.009[a]	0.049
Prevalence estimate	49.3%	54.2%	-0.740[b]	0.462
Admission estimate	31.0%	29.5%	0.221[b]	0.825
No of observations	34	35		
	Self-admitted			
Prevalence estimate	53%	65.08%	-1.500[b]	0.134
Admission estimate	33.6 %	40.12%	-0.886[b]	0.376
No of observations	14	25		
	Not Self-admitted			
Prevalence estimate	43%	42%	0.147[b]	0.8829
Admission estimate	31.8 %	29.5%	0.484[b]	0.6282
No of observations	121	123		

Notes: [a] denotes two-sample test of proportions and [b] denotes Wilcoxon-Mann-Whitney test; [c] $Prediction = (PrevalenceEstimate * AdmissionEstimate)$ and [d] $PredictionError_i = ((Prediction_i) - MeanAdmissionRate_i)^2$, where $i = Treated, Control$; [e] Prediction score calculated using the BTS algorithm Prelec (2004); [f] standard deviation;

References

Barrage, L., Lee, M. S., 2010. A Penny For Your Thoughts: Inducing Truth-telling in Stated Preference Elicitation. Economics letters 106 (2), 140–142.

Cox, J., Collins, A., Drinkwater, S., 2010. Seeders, Leechers and Social norms: Evidence from the Market for Illicit Digital Downloading. Information Economics and Policy 22 (4), 299–305.

Ford, R., Richardson, W., 2007. Ethical Decision Making: A Review of the Empirical Literature. Journal of Business Ethics 13 (3), 205–221.

Howie, P. J., Wang, Y., Tsai, J., 2011. Predicting New Product Adoption Using Bayesian Truth Serum. Journal of Medical Marketing: Device, Diagnostic and Pharmaceutical Marketing 11 (1), 6–16.

John, L. K., Loewenstein, G., Prelec, D., 2012. Measuring the Prevalence of Questionable Research Practices with Incentives for Truth Telling. Psychological science 23 (5), 524–532.

Jurca, R., Faltings, B., 2011. Incentives for Answering Hypothetical Questions. In: Proceedings of the 1st Workshop on Social Computing and User Generated Content.

Oh, L.-B., Teo, H.-H., 2010. To Blow or not to Blow: An Experimental Study on the Intention to Whistleblow on Software Piracy. Journal of Organizational Computing and Electronic Commerce 20 (4), 347–369.

Peace, A. G., Galletta, D. F., Thong, J. Y., et al., 2003. Software Piracy in the Workplace: A Model and Empirical Test. Journal of Management Information Systems 20 (1), 153–178.

Prelec, D., 2004. A Bayesian Truth Serum for Subjective Data. Science 306 (5695), 462–466.

Schulze, H., Mochalski, K., 2009. Internet Study 2008/2009. Tech. rep., IPOQUE Report.

Shaw, A. D., Horton, J. J., Chen, D. L., 2011. Designing incentives for inexpert human raters. In: Proceedings of the ACM 2011 conference on Computer supported cooperative work. ACM, pp. 275–284.

Siwek, S. E., 2007. The true cost of copyright industry piracy to the US economy. IPI Center for Technology Freedom.

Weaver, R., Prelec, D., 2013. Creating Truth-Telling Incentives with the Bayesian Truth Serum. Journal of Marketing Research 50 (3), 289–302.

Weiss, R. R. J., 2009. Optimally Aggregating Elicited Expertise: A Proposed Application of the Bayesian Truth Serum for Policy Analysis. Ph.D. thesis, Massachusetts Institute of Technology.

Zhao, E. J., Keane, M., 2013. Between Formal and Informal: the Shakeout in China's Online Video Industry. Media, Culture & Society 35 (6), 724–741.

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