

AN EXPERIMENTAL UNDERSTANDING OF TRANSACTION UTILITY IN PIRACY

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The present paper conducts a laboratory experiment with a sample of 209 students from Jadavpur University, Kolkata, India, within age group of 18–23 to study the prevalence of transaction utility in product piracy decision of the consumers. The experiment with four different treatments, treating price of original good as reference price for potential pirates uses standard descriptive statistics and logistic regression with clustered standard error at individual level to show that transaction utility is the statistically significant factor affecting the likelihood of piracy. Further, males and students belonging to Humanities are more inclined to product piracy.

Keywords: Experimental Economics, Behavioural Economics, Transaction utility, Piracy, Consumer Behaviour

JEL Classification: C91, D91, O34

1. INTRODUCTION

Thaler (2008) defines two types of utility attached with the consumption of a product, the first being acquisition utility which refers to the net consumer surplus the consumer enjoys, and the other being an additional utility that he receives by availing a good with a price lower than a reference price to him. This second type of utility is referred to as transaction utility by Thaler (2008). The reference price serves as a yardstick of comparison to the consumer, and the price differential gives him an added utility over his consumer surplus. The concept of transaction utility has been further studied in numerous contexts, including firm's behaviour in a competitive market, their price-quality decision and so on. However, the concept of transaction utility has not been experimentally validated in the analysis of end-user piracy.

Product piracy is done in two forms - end-user piracy and commercial piracy. The former refers to piracy at individual level and the latter defines piracy at the firm level. However, end-user piracy is predominant because of its degree of convenience to pirate any media file across any online platform. Piracy seems to give a certain psychological satisfaction to the pirates on account of availing a good at a much lower cost than the market version. The quality of the pirated product may be degenerated across various degrees, for example, downloading software or movie files or e-books from an illegal online platform often involves moderate to high degree of quality degradation. However, the sheer ability to avail a pirated copy of a good at a negligible price seems to give the pirate a feeling of contentment. In this paper we try to study this psychological satisfaction factor behind end-user piracy through a laboratory experiment.

Basu and Banerjee (2019) theorises the existence of transaction utility in context of end-user piracy and studies its impact on the price – quality decision of the original good producer using a theoretical model. The present paper attempts to validate the same concept through a laboratory experiment. The theoretical model in Basu and Banerjee (2019) assumes that the end-user pirate along with acquisition utility derives an additional utility from availing a pirated product at a much lower cost than the original version. The present paper attempts to experimentally analyse and validate the theoretical concept of existence and extent of transaction utility in context of end-user piracy.

The rest of the paper is arranged in the following manner. Section 2 provides a brief study on the existing literature. Section 3 gives the theoretical foundation of the paper, followed by Section 4 with the detailed experiment with treatment designs and methodology. Subsequently Section 5 gives the result of the experiment and discusses the same. The final Section 6 concludes the study.

2. LITERATURE BACKGROUND

The circumstance of transaction utility in end-user piracy is distinctive. While studying transaction utility of any other general good, the reference price that acts as a benchmark to the consumer does not really exist in the market in the same period. It refers to the price of the good in some previous period or that of a close substitute existing in the market. In case of end-user piracy however, both the original good and the copied version exist together in the same period in the market. The price differential between the reference price (original good) and the price of the product (pirated good) is a real parameter and not a perceived situation that impacts the purchasing decision of a potential consumer (pirate). Often the price differential between the original version of product and its copied version is stupendously high. Contrarily for most of the time there is trifling quality degradation in case of pirated version on account of highly efficient copying technology (Cho and Ahn, 2010; Wu, Chen and Anandalingam, 2008). This

situation serves as the perfect platform for generation of transaction utility for the end-user pirates.

Muehlbacher et al. (2011) conduct two experimental studies to demonstrate the role of transaction utility in consumers' purchase decision. The experiments reveal negative transaction utility has greater impact on consumers' purchase decision than positive transaction utility. The experimental designs of their paper contribute significantly to this paper regarding nature of conducting experiments related to transaction utility. Grewal et al. (1998) experimental paper too supports the hypothesis of the impact of buyer's internal reference price in his consumption decision.

Lichtenstein et al. (1990) study consumer behaviour in terms of coupon proneness (transaction utility) and value consciousness (acquisition utility). The literature reveals that coupon proneness which is similar to the concept of transaction utility is not isomorphic rather has a conceptual definition. The various factors, mostly socio-economic along with measure of value consciousness play part in deciding the degree of coupon prone behaviour of a consumer. Urbany et al. (1997) notice both the utilities in consumer behaviour and conclude that price differential is not the only significant cause behind transaction utility of a consumer, but the quality of the product plays a major role too. An experimental study shows that acquisition utility is in fact dominating over transaction utility, the latter being significant only when there is certainty of quality. Dodonova et al. (2004) empirically study consumer behaviour in an online website and found that products with more 'buy now' tag posted are sold more, even when prices are higher than the final price. This somehow amplifies the theory of a certain psychological satisfaction (transaction utility) attached to the deal. McNeill et al. (2013) demonstrate the degree of transaction utility varying over parameters like sales promotion and cultural differences. Chiang et al. (2013) study transaction utility in a market with mobile coupon and show that mobile users with higher degree of coupon proneness have higher understanding and positive attitude towards mobile coupons. Thus, in a way, transaction utility improvises consumer consciousness. Goh and Bockstedt (2009) use multipart pricing as an interesting tool to understand transaction utility. The literature shows that bundling and different pricing schemes affect the consumer behaviour through the route of transaction utility. Thus existing literature provide a clear insight regarding transaction utility and conditions behind its working. However, to best of our knowledge we did not come across studies that consider the issue of transaction utility in the context of product piracy.

The theoretical literatures on end user piracy contributing to clarify the idea of end-user piracy and its various facets are Banerjee et al. (2008), Alvisi et al. (2003), Cho et al. (2010) and Cremer et al. (2007). The empirical literatures on piracy investigate various factors that contribute to the individual's decision on piracy.

Borja et al. (2015) observe in music industry, frequent music streamers are potential music pirates. Logistic regression analysis of a sample of 197 college students reveal that a potential music pirate is a heavily peer-influenced, young, low-income and overconfident about risk and reward. Socio-demographic aspects are thus observed to be

significant factors behind piracy. In another study Borja and Dieringer (2016) conduct a survey of 1052 college students to investigate the factors determining music piracy, and the role of music streaming in the behavior of the individuals illegally downloading music. Using logistic regression analysis they observe that music streaming complements piracy, providing evidence that these two modes of music consumption coexist in the market. Further, social and peer behavior, risk perceptions, and online consumption time are elements contributing to music piracy. Phau et al. (2016) probe the factors impelling digital movie piracy and observe that habitual conduct, positive feeling towards acquiring the movie and facilitating conditions have significant influence upon attitudes toward downloading pirated movies. However, social factors are not found to have a significant relationship on attitudes toward downloading pirated movies from the internet. Arli and Tjiptono (2016), using a structural equation modeling approach in the context of Indonesia, observe that consumers' attitude toward digital piracy and perceived behavioral control significantly affect their intention to pirate digital products, while perceived benefits, moral obligation, and perceived behavioral control are predictors of consumers' attitude toward digital piracy. Interestingly, fear of legal consequences and perceived likelihood of punishment are not significant predictors of consumers' attitude towards digital piracy causing piracy deterrent policies ineffectual. Pop *et al.* (2017), using data from Romania observe that when consumers have the opportunity, they will always find ways of cheating in terms of piracy. Also, *attitude* and *perceived behavioural control* act as influencing factors for digital piracy in the context of Romanian consumers. Consumers may be inclined to be opportunistic when they feel that piracy behaviour can be performed effortlessly. Dilmeri et al. (2017) also observe intention to acquire music via an illegal channel is influenced by the perceived benefits of piracy. The above papers mostly consider the attitude/intention and perceived behavioral control based explanation of digital piracy based on primary survey. Thus, none of the studies we come across use a controlled laboratory environment to determine the probability of choosing a pirated good by an agent. Our study fills these gaps in the existing literature.

In our study, we measure the effect of transaction utility and the relative trade-off between acquisition utility and transaction utility on decision of acquiring a pirated product with the help of an experiment with 209 subjects in a laboratory setup. The first treatment intends to comprehend the existence of transaction utility among consumers at the very pretext. The next two treatments examine the effect of transaction utility when the quality of the pirated goods and as well as original good varies. The fourth treatment however, incorporates a trade-off between acquisition utility and transaction utility of possessing a pirated good. The laboratory set up provides an equal access to technology in the same environment to all subjects while taking the piracy decision. Thus, under this circumstance, our study helps us to identify the behavioural motive in terms of enjoying transaction and acquisition utility behind the act of digital piracy among the group of students with various socio-economic and demographic parameters.

Intriguingly, for all the treatments, transaction utility proves to be a significant factor behind pirating information good while we are controlling other socio demographic variables. To the best of our knowledge, we have not come across any literature that has dealt with this issue in context of end – user piracy. Thus, our paper uniquely contributes to the existing literature by analysing the effect of transaction utility in the piracy decision of end-user pirates using an experimental set up.

3. THEORETICAL FOUNDATION

Thaler (1983) defines transaction utility that “represents pleasure (or displeasure) associated with the financial terms of the deal per se”. This concept has been incorporated in the utility function of the consumer in our model who has been given a choice between purchasing an original version of a good and its pirated version. We assume there is a continuum of heterogeneous consumers, varying across their net valuation (acquisition utility) for the product. There are two versions of a good in the market – the original and the copied or pirated one. The goods generally represent information good or media files like software, book, movie files, music files, e-books and so on. The original version of the good is naturally of superior quality, say q , and the pirated version is a degraded copy of the same with quality level αq , $\alpha \in [0,1]$. We can define α as the piracy efficiency parameter of a given economy. The closer the value of α is to one, the technology used for pirating the original good produces almost the perfect substitute of the original good. The price paid by the consumer to acquire one unit of the original good is denoted by p , and the copied version of the same good is availed at a trivial cost c . The utility function of a representative consumer following Basu and Banerjee (2019) can thus be given as –

$$U(\theta) = \begin{cases} \theta q - p & \text{when consumer purchases 1 unit of original product} \\ \theta \alpha q - c + \lambda(p - c) & \text{when consumer pirates} \\ 0 & \text{when consumer purchases nothing} \end{cases}, (1)$$

where θ represents the valuation of the product to the consumer or simply ‘willingness to pay’ for a product. When a consumer decides to buy an original good, he enjoys only acquisition utility or in other words, only the net valuation from the product ($\theta q - p$). However when he chooses to copy the same product by incurring copying cost c , along with acquisition utility, he is assumed to enjoy an additional utility, the transaction utility or a certain psychological satisfaction from the deal itself. The transaction utility is thus represented by $\lambda(p - c)$, where λ represents the transaction utility parameter. $\lambda > 0$ and it gives the degree by which the total utility varies with respect to the variation in the transaction utility. The present study hypothesised that a consumer enjoys transaction utility along with acquisition utility when he chooses to pirate; we

conduct an experiment with four distinct treatments to perceive the existence and impact of transaction utility. The subsequent section gives the detail of the experiment.

When the quality of a pirated good is identical or very close to the original good ($\alpha \cong 1$), then the value of the pirated good to consumer is also very close to that of the original good. Now, if the price of the pirated good is significantly lower than that of the original good ($p > c$), then the acquisition utility ($\theta\alpha q - c$) derived from the pirated good will be higher than the acquisition utility ($\theta q - p$) derived from the original good. In addition, there is the component of higher transaction utility [$\lambda(p - c)$] attached to piracy decision as the price of the pirated good is lower than that of the original good, assuming that the quality of the pirated version is as good as the original.

4. THE EXPERIMENT

To segregate the impact of higher acquisition utility from transaction utility, the material or nominal payoff has not been distributed to the subjects. Consequently, the motivation of obtaining higher acquisition utility has been blocked and what remains is only transaction utility, that is, the perceived or psychological value of the transaction. This has been done by non-incentivising the experiment and paying the subjects their show-up fees.

A total number of 210 students have participated in the experiment with 15 participants in 14 sessions. However, owing to incomplete information, we have to drop one subject data and perform the analysis with remaining data of 209 subjects. The participants are all students of Jadavpur University, Kolkata, India and have been selected in equal proportion from humanities, science and engineering courses, 60% of them being male and the remaining 40% female. The participants have been initially asked to fill up an anonymous socio-economic information questionnaire to explore the relationship between piracy decision and socio-demographic factors like age, sex, stream of education, number of years of education, medium of education, native place, religion, caste, family's annual income, monthly income of the participants, average monthly data consumed etc. Subsequently, they have been given a sheet of paper consisting of general instruction, experiment protocol which has also been read out to them. After the instructions have been given, the participants have been asked to play the treatments in their respective personal computers, without any mutual consultation. The responses of the participants have been retrieved by us with the assistance of Z-Tree software instantaneously. The course of experimental sessions got over in a span of 45 days in the period of July to September 2019. Each session has lasted between 25 and 30 minutes during which communication between subjects has not been allowed. Each session has four treatments, and, in each treatment, the subjects have been asked to make four non-incentivised choices and have been paid a show up fee of Rs. 200 each. The details of the choices are being given below in the next sub-section.

4.1. Design and Treatments

The participants have been asked to play the role of a buyer and make their respective purchase decisions. They have been provided with two purchase options – one for an original version of a good and the other for the pirated version. The actual valuation or ‘willingness to pay’ for both the versions have been given to them along with the prices that they have to pay for each of them. Additional information of reference price has also been provided, wherein the reference price is nothing but the price of the original version of the good. When the buyer chooses to buy the original good, his reference price and market price (price that he pays) coincide. However, if he chooses to buy the pirated version, the price of the original version acts as a point of reference or comparison to him. The idea of net valuation or acquisition utility has been clearly demonstrated to them as the total valuation less the market price they pay for the product. The decision to non-incentivise the experiment has been made to segregate the impacts of higher monetary pay-offs with transaction utility of the choices made. Each option has the following information in the form - (actual worth, reference value, selling price).

Treatment 1: This treatment aims to check the role of transaction utility in purchase decision irrespective of pirated good or not. The participants have been given four different purchasing choices. For each of the choices, they have been given two options to choose from. The first option always comes with an unknown reference price X , whereas the second option has a known reference price. The participants have been asked to choose between the two options for each choice. Further, it may be noted that it has been emphatically mentioned to the participants that the unknown reference price (X) can be either higher or lower than the price they are paying for the product. This has been intended to observe the impact of declining difference between the reference price and the price paid.

The four different choices with two options for each choice, given to the purchasers are specified in Table 1, where the first value in all the options reveals the valuation for the product to the purchaser, the second value represents the reference price and the third value represents the price that the purchasers pay to acquire the product.

Table 1. Details of Treatment 1

| Choices | Option A | Option B | % of subjects choosing Option B with known reference price |
|---------|-----------------|---------------|--|
| 1 | (100, X , 25) | (100, 75, 25) | 76.67% |
| 2 | (100, X , 25) | (100, 50, 25) | 77.03% |
| 3 | (100, X , 25) | (100, 30, 25) | 52.63% |
| 4 | (100, X , 25) | (100, 10, 25) | 24.88% |

Source: Lab experiment conducted by the authors.

It has been mentioned to the participants that their monetary gain from all of their transaction would be amounting to net valuation (i.e. valuation less the market price) and that reference price has given only as a point of comparison while they purchase the good.

We observe that revelation of reference price has actually been influencing the choice of the subjects. This treatment proves the existence of transaction utility in purchase decision irrespective of pirating or not. It is revealed that a majority of the participants has significantly chosen options with known transaction utility over an unknown transaction utility. It must be noted that in both the cases, the acquisition utility has been held constant. As expected, in choice 4 where reference price is lower than the actual price of the product, most of the subjects choose option A with unknown reference price. We have also performed Cochran's Q^1 test with test statistic equals to 162.76 with $df = 3$ and $p - value = 0$.²

Treatment 2: This treatment has been designed to capture the impact of transaction utility on purchase decision when quality of only the copied product (that is α) and its respective market price (copying cost) decline steadily for hypothetical pirated good. Our idea is to check when quality of the pirated good is declining due to a fall in α for use of cheaper copying technology (manifested by a low 'c', value) to what extent does transaction utility drive piracy decision. This treatment too consists of four choices. For each choice the participants have been given two options to choose from. The first option (Option A) represents the hypothetical original version of product while the second option (Option B) represents the pirated version. If the participant chooses to buy Option A, which remains unchanged at (100, 75, 75) for all four choices, he receives only acquisition utility with no reference price to obtain transaction utility from. However, for Option B, the participant receives both acquisition utility (= 25 for all cases) and transaction utility that improves gradually (25, 35, 45, 50) for the four respective choices. The valuation of the pirated product however decreases over the choices (75, 65, 55, 50) implying a fall in quality of pirated good, as well their market prices from choice 1 to choice 4. The treatment has been designed to arrest the effect of transaction utility, for gradual degradation of quality of pirated products. The detail of the treatment is depicted in Table 2.

¹ Cochran's Q Test is a non-parametric test that finds differences in matched samples of three or more frequencies or proportions. It is used to check the effects of different treatments on same set of respondents.

² We have also conducted pair wise McNemar's test taking choice 1 as control and choice 2,3,4 as treatment. The McNemar test is a non-parametric test to compare a change in proportion for the paired data after a treatment is being given. Results show that there is insignificant difference between Choice 1 and 2 (McNemar's $\chi^2(1) = 0.02$, $Prob > \chi^2 = 0.8886$). However, Choice 3 and choice 4 are significantly different from choice 1. McNemar's $\chi^2(1) = 27.17$, $Prob > \chi^2 = 0.0000$ between choice 1 and 3. And, McNemar's $\chi^2(1) = 77.76$, $Prob > \chi^2 = 0.0000$ for choice 1 and 4 where in choice 4 reference price is lower than the market price.

Table 2. Details of Treatment 2

| Choices | Option A (Original Good) | Option B (Pirated Good) | % of subjects choosing Option B |
|---------|-----------------------------|----------------------------|---------------------------------|
| 1 | (100, 75, 75) | (75, 75, 50) | 43.06% |
| 2 | (100, 75, 75) | (65, 75, 40) | 52.63% |
| 3 | (100, 75, 75) | (55, 75, 30) | 58.37% |
| 4 | (100, 75, 75) | (50, 75, 25) | 53.58% |

Source: Lab experiment conducted by the authors.

We observe that there is a trade-off between product quality (valuation of the good) and transaction utility enjoyed by the subjects. In choice 1, when the quality difference between pirated and original good is small (that is α is high) and transaction utility is also low, only 43.33% of the subjects opts for pirated good. However, with deteriorating quality of pirated good relative to the original good (when α declines), the price differential which amounts to transaction utility keeps rising. We observe, in Choice 2, 52.63% of respondents opts for pirated good and in Choice 3, 58.37% of same opts for pirated good. However, in Choice 4 when the quality difference between pirated and original good is the highest, around 53.58% of subjects opts for pirated product, lower than that in Choice-3. In this case test statistic for Cochran's Q is 13.3913 with $df = 3$ and $p - value = 0$.³ Thus, it is observed that when transaction utility is increasing, the quality of the pirated good is declining and the acquisition utility remaining unchanged, the percentage of people choosing pirated good (Option B) increases despite quality degradation till a certain level, then reverses.

Treatment 3: This treatment is designed to comprehend the influence of transaction utility when quality of both the original and its copied version improve gradually along with their respective market prices on the purchase decision of the subjects. In this treatment α is kept constant approximately at 0.75). This treatment too has a set of four choices. For each of the choices, the participants have been given two hypothetical options where the first option represents the original version and the second option represents the pirated version. If the participant decides to purchase the original good, he receives only a constant acquisition utility (= 25) with no transaction utility with gradual increase in valuation (quality) of the good (100, 125, 150, 175) for subsequent choices. For the pirated version being chosen, the participant receives both acquisition utility and

³ We have also performed McNemar's pairwise test taking choice 1 as control. In this case, it shows that there is significant differences in proportion of respondents choosing pirated product between choice 1 and Choices 2, 3 and 4.

McNemar's $\chi^2(1) = 5.26$, $Prob > \chi^2 = 0.0218$ for comparison between choice 1 and 2.

McNemar's $\chi^2(1) = 8.98$, $Prob > \chi^2 = 0.0027$ for comparison between choice 1 and 3.

McNemar's $\chi^2(1) = 4.40$, $Prob > \chi^2 = 0.0359$ for comparison between choice 1 and 4.

transaction utility. For pirated good, the acquisition utility has been kept unchanged for all the choices at 25 while the quality of the pirated version improves for subsequent choices (75, 94, 113, 131) thereby increasing transaction utility (25, 31, 37, 44).

The treatment is showed in Table 3.

Table 3. Details of Treatment 3

| Choices | Option A (Original Good) | Option B (Pirated Good) | % of subjects choosing Option B |
|---------|-----------------------------|----------------------------|---------------------------------|
| 1 | (100, 75, 75) | (75, 75, 50) | 33.49% |
| 2 | (125, 100, 100) | (94, 100, 69) | 55.50% |
| 3 | (150, 125, 125) | (113, 125, 88) | 63.64% |
| 4 | (175, 150, 150) | (131, 150, 106) | 63.64% |

Source: Lab experiment conducted by the authors.

The first choice of option 1, where transaction utility is low, only 33.49% of the subjects opt for the pirated good. We observe that as the quality level of both the original and the pirated goods gradually improve along with a rise in the transaction utility from purchase of pirated good, majority of the sample opts for the pirated good. In this case Cochran's Q test statistic is 69.0390 with $df = 3$ and $p - value = 0$.⁴ Here again we observe that as transaction utility (TU) increases along with quality differential between pirated and original good with unchanged acquisition utility (= 25), percentage of consumers likely to pirate increases steadily.

Treatment 4: The design mechanism aims at checking the relative trade-off between acquisition utility and transaction utility of the consumers on the product piracy decision. The first option (Option A) of all the choices represents the hypothetical original version of the good with constant acquisition utility 25 and no transaction utility. The second option (Option B) represents the hypothetical pirated version of the good, similar to the previous treatments, but the four choices in this treatment have been designed such that a reduction in acquisition utility is paired with an upsurge in transaction utility. In option B, the first and the third choices of the treatment have same acquisition utility (24) with respective increasing transaction utility equal to 25 and 50 respectively. Alternatively, the second and fourth choices (pirated good) have same acquisition utility (22) with

⁴ In this case taking Choice 1 as control we observe that McNemar's pairwise test statics is always significant when Choice 2, Choice 3 and Choice 4 are considered as treatments with Choice 1 as the control.

McNemar's $\chi^2(1) = 25.80$, $Prob > \chi^2 = 0.0000$ for comparison between choice 1 and 2.

McNemar's $\chi^2(1) = 40.92$, $Prob > \chi^2 = 0.0000$ for comparison between choice 1 and 3.

McNemar's $\chi^2(1) = 36.41$, $Prob > \chi^2 = 0.0000$ for comparison between choice 1 and 4.

rising transaction utility of 45 and 90 respectively. These, values for acquisition utility and transaction utility are obtained by suitably varying the values for α and c . The treatment has been intentionally designed in such a manner to check random responses from the participants with the incentive to compare the relative weights of the two utilities associated with a purchasing decision of a given consumer. The acquisition utility provides the consumer with monetary gain (value consciousness) in terms of enhanced consumer surplus. Alternatively, transaction utility gives the buyer a psychological satisfaction from the deal itself (Thaler, 1983). It seems a motivating idea to us to compare these two, to get some profound result.

Table 4. Details of Treatment 4

| Choices | Option A (Original Good) | Option B (Pirated Good) | % of subjects choosing Option B |
|---------|-----------------------------|----------------------------|---------------------------------|
| 1 | (200, 175, 175) | (174, 175, 150) | 36.84% |
| 2 | (200, 175, 175) | (152, 175, 130) | 42.58% |
| 3 | (200, 175, 175) | (149, 175, 125) | 55.02% |
| 4 | (200, 175, 175) | (107, 175, 85) | 61.24% |

Source: Lab experiment conducted by the authors.

A comparison between the first and the third option shows that, more number of subjects choose to pirate in option 3 vis-à-vis option 1 where McNemar's $\chi^2(1) = 16.79$, $Prob > \chi^2 = 0.0000$.

The same result has been obtained by comparing option 2 and option 4 where McNemar's $\chi^2(1) = 17.48$, $Prob > \chi^2 = 0.0000$. Thus, we observe, as the transaction utility level increases from option 1 to option 4, more subjects opt for pirated product.

4.2. Econometric Methodology and Data

The methodology that is being followed to obtain the determinants of probability of choosing pirated good is standard logistic regression model with clustered standard error at the individual level. Suppose we have m individuals who have given their responses for k number of times, for a particular treatment in the experiment. Let y_{ij} be the binary variable showing the response of i^{th} individual's j^{th} response in a representative treatment. In our case $i = 1, 2, \dots, 209$ and $j = 1, 2, 3, 4$ for each treatment. Thus, for a particular treatment we have a total of 836 binary responses. Let $y_{ij} = 1$, if the subject chose pirated good over original good. Let p_{ij} be the conditional probability, that $y_{ij} = 1$. We define our model in this way:

$$\ln\left(\frac{p_{ij}}{1-p_{ij}}\right) = \beta_0 + \beta_1 \text{transaction utility level}_{ij} + \zeta X_{controls_{ij}}$$

Here, we introduce transaction utility level of i^{th} individual for j^{th} response in each treatment to observe the effect of this variable on the purchase decision of pirated product. $X_{controls_{ij}}$ gives the vector of other control variables. Since in this case, each individual has taken purchase decision four times for a treatment, it could have led to correlation among the responses of an individual. To take account of correlated binary choices, we estimate the model under the assumption of clustered standard error at the individual level. We have used STATA 15 for the estimation process. We also run three different regressions for different treatments as each of our treatment is designed on the basis of different rationale. Treatment 2 checks the incidence of piracy when transaction utility is increasing with declining quality of the pirated good and unchanged acquisition utility. Treatment 3 considers the influence of transaction utility on piracy decision when quality of both the original and its copied version improve gradually along with their respective market prices, with piracy efficiency parameter α remaining constant. Finally, Treatment 4 shows the effect of variation in relative weight of transaction utility and acquisition utility on piracy decision. Hence, we run three different regression models.⁵

Next we describe the rationale behind the control variables included in the study.

Socio Demographic Control Variables

Following Dilmeri et al. (2011), Borja et al. (2015) and Borja and Dieringer (2016), we have included following socio-economic and demographic variables in the study: like sex, annual family income and education stream in the model.

Sex: It is generally argued that it is the males rather than females who are more habitual to piracy. Thus, to check this observation we included age as one control variable in the regression analysis.

Annual Family Income: Family income is one important determinant of purchase pattern of any individual (Mcneill, Fam and Chung, 2013; Gunter, 2009; Borja, Dieringer and Daw, 2015). That is why we included in the regression analysis.

Education Stream: In our experiment we have students from three education streams: Humanities, Science and Engineering. We included this variable to check if technical education that entails knowledge of computer programmes gives higher incidence of piracy or not (Gomes, Cerqueira and Almeida, 2014; Borja, Dieringer and Daw, 2015).

⁵ Our esteemed reviewer suggested that we should run a regression by consolidating information from all three treatments on piracy incidence. We run the regression with the above set of explanatory variables and one extra categorical variable for identification of the treatments. Results show that students from Humanities are more likely to pirate. Transaction utility and acquisition utility both are increasing the incidence of piracy. Finally, the subjects are more likely to use pirated good for situation depicted by Treatment 3, compared to that by Treatment 2 (reference category). The results are available with the author on request.

Monthly data pack used in GB: We also include monthly data pack used in GB as a variable to take account of the intensity of online activity of the respondent. Rochelandet and Le Guel (2005), Borja and Dieringer (2016) argue that prolonged online activity increases the probability of piracy of digital product.

We have not included age of the respondent in the analysis as all of them are students and have little variation in age.

For each regression model, we have reported the model with lowest values of AIC and BIC. As a result, models that included variables like caste, religion or place of residence (rural/urban) are not reported. Table 5 reports the detail description of the explanatory variables included in the regression analysis for 209 individuals.⁶

Table 5. Description of the Demographic Characteristics of the Subjects

| Variable Name | % in case of Dummy/ Category Variables | Mean | Std. Dev. | Min | Max |
|--|---|--------|--------------|-------|----------|
| Sex Dummy | | | | | |
| Male = 0 | 63.160% | 0.370 | 0.480 | 0.000 | 1.000 |
| Female = 1 | 36.840% | | | | |
| Edu stream | | | | | |
| Humanities | 32.540% | 0.325 | 0.470 | 0.000 | |
| Science | 33.010% | 0.330 | 0.470 | 0.000 | |
| Engineering | 34.450% | 0.340 | 0.480 | 0.000 | |
| Annual Family income (in Lakhs of Rs.) | --- | 5.470 | 8.370 | 0.300 | |
| Monthly internet data pack used (in GB) | --- | 42.620 | 83.060 | 0.750 | 1000.000 |

Source: Estimation based on experiment data.

5. RESULTS AND DISCUSSIONS

5.1. Results

This section gives the econometric analysis of our experimental study to determine the factors affecting the probability of piracy by the subjects for each of the respective

⁶ Association between the explanatory variables are in Appendix 1.

treatments in a controlled laboratory environment with same facilitating technological conditions with no threat of punishment for piracy. The results are summarized in Table 6 for Treatment 2, Treatment 3 and Treatment 4.

Table 6. Results of Logistic Regression on Experiment Data

| | Treatment 2 | | Treatment 3 | | Treatment 4 | |
|--|---------------------------------|---|------------------------------------|---|---------------------------------|---|
| Outcome variable: Probability of choosing pirated good | Coef. (Robust Std. Err #) | Marginal Effect (Delta-method Std.Error) | Coef. (Robust Std. Err #) | Marginal Effect (Delta-method Std.Error) | Coef. (Robust Std. Err #) | Marginal Effect (Delta-method Std.Error) |
| Explanatory Variables | | | | | | |
| Sex Dummy Male = 0 Female = 1 | -0.30* (0.18) | -0.072* (.044) | -0.121 (0.218) | -0.028 (0.051) | 0.33 (0.20) | 0.078 (0.048) |
| Education Stream Reference Category: Humanities | | | | | | |
| Science Stream | -0.670*** (0.230) | -0.165*** (0.05) | -0.456* (0.260) | -0.106* (0.060) | -0.290 (0.230) | -0.068 (0.056) |
| Engineering Stream | -0.57** (0.23) | -0.142** (.05) | -0.428* (0.258) | -0.100* (.059) | -0.01 (.24) | -0.003 (.059) |
| Annual Family income (in Lakhs of Rs.) | 0.020 (0.010) | 0.005 (.003) | 0.012 (0.011) | 0.003 (0.003) | 0.004 (0.130) | 0.001 (0.003) |
| Monthly internet data pack used (in GB) | -0.000 (0.001) | 0.000 (.000) | 0.001 (0.001) | 0.000 (.0001) | -0.000 (0.001) | -0.000 (0.000) |
| Transaction Utility | 0.020*** (0.010) | 0.005** (0.002) | 0.006** (0.011) | 0.015*** (0.002) | 0.0201*** (.0038) | 0.005*** (0.001) |
| Acquisition Utility | | | | | 0.180** (0.080) | 0.042** (0.019) |
| Constant | -0.270 (0.370) | | -1.790 (0.427) | | -5.210 (1.960) | |
| Number of observations | 836 | | 836 | | 836 | |
| Wald $\chi^2(7)$ | 20.790 | | 43.780 | | 35.000 | |
| $Prob > \chi^2$ | 0.002 | | 0.000 | | 0.000 | |
| Log pseudo likelihood | -564.923 | | -551.433 | | -559.383 | |
| Pseudo R ² | 0.0241 | | 0.0438 | | 0.0343 | |
| Hosmer-Lemeshow $\chi^2(8)$ | 6.340 | | 12.330 | | 4.240 | |
| $Prob > \chi^2$ | 0.610 | | 0.1369 | | 0.8349 | |
| AIC | 1143.846 | | 1116.867 | | 134.766 | |
| BIC | 1176.947 | | 1149.968 | | 11172.595 | |

Notes: # Standard errors are corrected for 209 clusters at individual level. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Source: Estimation based on experiment data.

5.2. Discussion of Results

5.2.1. *The Effect of Transaction Utility and Acquisition Utility on Piracy Decision*

The results of the logistic regressions show that under all three treatments as discussed in Section 4.1, transaction utility positively and significantly affects the probability of choosing pirated good by the consumer. Thus, the mental accounting of transaction utility enjoyed by the subjects under various treatments affects their decision to choose pirated good in laboratory environment.

In Treatment 2, we have gradually declined the quality and price of the hypothetical pirated good relative to the hypothetical original good, thereby raising the level of transaction utility. We observe that the probability of purchasing pirated good goes up by 0.5 percentage point for a unit increase in transaction utility while controlling for other explanatory variables.

In case of Treatment 3, an amelioration of quality coupled with a rise in price of the hypothetical original good improves the quality of the hypothetical copied version while the copying cost remains trivial as before. As a result, the subjects of our experiment mentally account an increase in transaction utility and for a unit increase in transaction utility the probability of purchase of pirated good increases by 1.5 percentage points.

Finally, we come to Treatment 4 where both the acquisition utility and transaction utility from purchasing of the hypothetical pirated product vary. In this case, for a unit increase in transaction utility, the purchase probability of pirated good goes up by 0.5 percentage points. In Treatment 4, the change in acquisition utility has been included as an explanatory variable. We observe that for a unit increase in acquisition utility the probability of piracy goes up by 4.2 percentage point. This clearly indicates the importance of value consciousness of the consumers (measured by valuation of product per unit of quality net off price, as shown in equation 1) on the purchase decision of the pirated good while controlling for different explanatory variables, and differences in technological access and possibility of punishment in the laboratory set up. Thus, high quality copy at low cost will always induce consumers to go for product piracy.

The empirical studies on piracy by Gopal and Sanders (1997, 2000), Peace et al. (2003), Kariithi (2011), Borja et al. (2015), Borja and Dieringer (2016), Bhattacharjee et al. (2003), Arli and Tjiptono (2016) noted that high price of the original information good is an important factor behind product piracy. Our experiment also ascertains that, existence of transaction utility, defined as the difference between price of original good (reference price) and copying cost of pirated good significantly impacts the piracy decision. However, the sheer chance of enjoying almost unadulterated quality good at a negligible price (acquisition utility) also have strong impact on piracy decision.

5.2.2. *Effects of Socio Demographic Variables on the piracy Decision*

We observe in case of Treatment 2, probability of doing piracy is 7.2 percentage

points lower for female subjects visà vis male at 10% level of significant. This result is in line with the standard literature that females are less likely to practice piracy compared to their male counterparts (Chiang and Assane, 2008). Next, we observe that in case of Treatment 2 and Treatment 3, probability of piracy is significantly higher for students from Humanities compared to Science and Engineering streams. The study by Borja et al. (2015) and Borja and Dieringer (2016) observe that educational stream is insignificant in explaining piracy probability. However, our study observe that even though students from science and technology background are expected to have superior knowledge about computer languages and other techniques, still they are less likely to indulge in piracy decision in a laboratory environment compared to students from Humanities.⁷ Rests of the variables are found to be insignificant.

6. CONCLUSION AND LIMITATION TO THE STUDY

Our paper bridges a gap in literature on consumer behaviour related to product piracy by incorporating the concept of transaction utility in the piracy decision made by the consumers in a laboratory environment setup with no threat of punishment and similar technological facility for all participants. The paper treats the price of the original good as reference price and assumes that a consumer receives transaction utility from piracy from the difference between the price of the original good and a much lower copying cost in case of end user piracy. In a non-incentivised laboratory experiment with 209 voluntary participants from Jadavpur University, Kolkata, India, across various streams of education in the age group of 18-23, the result shows that transaction utility positively and significantly affects the likelihood of product piracy across various treatments applied in the experiment. The experiment was decisively made non-incentivised to segregate the impact of transaction utility from that of acquisition utility on the likelihood of choosing pirated good by the consumers. In one treatment we also vary the acquisition utility or net valuation of the pirated good and observe that it too affects the piracy decision positively. Also, we observe that the male subjects and students belonging to Humanities are more prone to product piracy.

The result of this experimental study is in line with the theoretical result in Basu and Banerjee (2019), in which transaction utility has been considered to be a vital factor in the context of end-user piracy and its impact has been studied regarding price-quality decision of the original good producer.

⁷ The reason may be as follows: the students from Humanities consist of students from Literature, Language, History, Sociology, Philosophy, Economics and Political Science Departments. They require different books, copies of old books, media files like movie files, music files for their studies which they are eager to pirate when available.

Given the findings of our paper we have few interesting policy prescriptions. The organisations facing the problem of extensive end-user piracy can opt for two different tactics: in one hand deterrent techniques (or preventive controls as conceptualised by Gopal and Sanders, 1997) can be used to make the process of copying technologically more difficult, thereby raising the copying cost. This in turn will reduce the extent of transaction utility or psychological satisfaction from the act of piracy. Alternatively, the price of original good can be decreased to reduce the price differential between the original and the pirated good. A possible way out for it can be the implementation of product versioning policy and produce a lower quality version of the product for the masses with relevant lower prices to keep the price differential between the original and the pirated product in check (thus checking the associated transaction utility). Literatures on product versioning as a tool to enhance profit in piracy infested market (Slive and Bernhardt, 1998; Wu et al., 2003; Basu and Banerjee, 2018) can contribute to modify the pricing policies of the organisations.

The present study even with its unique contribution suffers some limitations. There is further scope of extending the study by including other socio-economic dynamics of the participants like their average university score in last few years, degree of app usages to analyse the intensity of transaction utility derived from the act of piracy due to them. Also, the study can be conducted over a bigger sample of participants varying across their age and evaluate whether transaction utility deriving proneness out of piracy is more among the young people or not.

APPENDIX

Table A1. Table of Association between the Variables

| Biserial Correlation between Binary Variables and Continuous Variables | | |
|---|--------------------------------------|---------------------------------------|
| | Annual Family income in Lakhs of Rs. | Monthly internet data pack used in GB |
| Sex | 0.2188 | -0.1199 |
| Education Stream | Humanities | 0.1941 |
| | Science | -0.0522 |
| | Engineering | 0.1531 |
| | -0.1397 | -0.0606 |
| Pearsonian Correlation Between Annual Family income in Lakhs of Rs. and Monthly internet data pack used in GB is 0.1076 | | |
| Cramer's V between Sex Dummy and Education Stream is 0.42 | | |

REFERENCES

- Alvisi, M., E. Argentesi and E. Carbonara (2002), "Piracy and Quality Choice in Monopolistic Markets," Quaderni-Working Paper DSE. No. 436.

- Arli, D. and F. Tjiptono (2016) "Consumer Digital Piracy Behaviour among Youths: Insights from Indonesia," *Asia Pacific Journal of Marketing and Logistic*, 28(5), 898-922.
- Banerjee, D.S., T. Banerjee and A. Raychaudhuri (2008), "Optimal Enforcement and Anti-copying Strategies to Counter Copyright Infringement," *Japanese Economic Review*, 59(4), 519-535.
- Basu, P. and T. Banerjee (2018), "A Theoretical Analysis of Product Versioning in the Context of Commercial Piracy," *Economic Annals*, 63(219), 115-135.
- ____ (2019), "Transaction Utility of End-User Pirates: An Analysis," *Review of Marketing Science*, 16(1), 109-132.
- Bhattacharjee, S., R.D. Gopal, and G.L. Sanders (2003), "Digital Music and Online Sharing: Software Piracy 2.0?" *Communications of the ACM*, 46(7), 107-111.
- Borja, K., S. Dieringer and J. Daw (2015), "The Effect of Music Streaming Services on Music Piracy among College Students," *Computers in Human Behavior*, 45, 69-76.
- Borja, K. and S. Dieringer (2016), "Streaming or Stealing? The Complementary Features between Music Streaming and Music Piracy," *Journal of Retailing and Consumer Services*, 32, 86-95.
- Chiang, E.P. and D. Assane (2008), "Music Piracy among Students on the University Campus: Do Males and Females React Differently?" *Journal of Socio- Economics*, 37(4), 1371-1380.
- Chiang, H.H., H.Y. Lin, and S.C. Tu (2013), "Analyzing Behaviors Influencing Use of Mobile Coupons from the Perspective of Transaction Utility," *Social Behavior and Personality: An International Journal*, 41(3), 433-441.
- Cho, W.Y. and B.H. Ahn (2010), "Versioning of Information Goods under the Threat of Piracy," *Information Economics and Policy*, 22(4), 332-340.
- Cremer, H. and P. Pestieau (2009), "Piracy Prevention and the Pricing of Information Goods," *Information Economics and Policy*, 21(1), 34-42.
- Dilmeri, A., T. King and C. Dennis (2011), "Pirates of the Web: The curse of Illegal Downloading," *Journal of Retailing and Consumer Services*, 18(2), 132-140.
- ____ (2017), "Toward a Framework for Identifying Attitudes and Intentions to Music Acquisition from Legal and Illegal Channels," *Psychology and Marketing*, 34(4), 428-447.
- Dodonova, A. and Y. Khoroshilov (2004), "Anchoring and Transaction Utility: Evidence from On-line Auctions," *Applied Economics Letters*, 11(5), 307-310.
- Goh, K. H., and J. Bockstedt (2009), "Transaction Utility Theory and the Framing of Multipart Pricing of Information Goods," available at <https://pdfs.semanticscholar.org/ae70/08d8cf9cc967b5b68b6dc8d524e77a5fd2a0.pdf>
- Gomes, N.D., P.A. Cerqueira and L.A. Almeida (2014), "Software Piracy: A Critical Survey of the Theoretical and Empirical Literature," GEMF Working Papers, No. 2014-05.
- Gopal, R.D. and G.L. Sanders (1997), "Preventive and Deterrent Controls for Software Piracy," *Journal of Management Information Systems*, 13(4), 29-47.
- ____ (2000), "Global Software Piracy: You Can't Get Blood out of a Turnip," *Communications of the ACM*, 43(9), 82-89.
- Grewal, D., K.B. Monroe and R. Krishnan, (1998), "The Effects of Price-Comparison Advertising on Buyers' Perceptions of Acquisition Value, Transaction Value, and

- Behavioral Intentions,” *Journal of Marketing*, 62(2), 46-59.
- Gunter, W.D. (2009), “Internet Scallywags: A Comparative Analysis of Multiple Forms and Measurements of Digital Piracy,” *W. Criminology Review.*, 10, 15.
- Kariithi, N.K. (2011), “Is the Devil in the Data? A Literature Review of Piracy around the World,” *Journal of World Intellectual Property*, 14(2), 133-154.
- Lichtenstein, D.R., R.G. Netemeyer and S. Burton, (1990), “Distinguishing Coupon Proneness from Value Consciousness: An Acquisition-Transaction Utility Theory Perspective,” *Journal of Marketing*, 54(3), 54-67.
- McNeill, L.S., K.S. Fam, and K. Chung, (2014), “Applying Transaction Utility Theory to Sales Promotion - The Impact of Culture on Consumer Satisfaction,” *International Review of Retail, Distribution and Consumer Research*, 24(2), 166-185.
- Muehlbacher, S., E. Kirchler and A. Kunz (2011), “The Impact of Transaction Utility on Consumer Decisions,” *Journal of Psychology*, 219(4), 217-223.
- Peace, A.G., D.F. Galletta and J.Y. Thong (2003), “Software Piracy in the Workplace: A Model and Empirical Test,” *Journal of Management Information Systems*, 20(1), 153-177.
- Phau, I., M. Teah and J. Liang (2016), “Investigating the Factors Influencing Digital Movie Piracy,” *Journal of Promotion Management*, 22(5), 637-664.
- Pop, C.M., A.I. Romoñi-Maniu and M.M. Zaharie, “Opportunistic Consumer Behaviour in the Context of Digital Piracy,” in MIC 2017: Managing the Global Economy; Proceedings of the Joint International Conference, Monastier di Treviso, Italy, 24-27 May, 523-528, University of Primorska Press.
- Rochelandet, F. and F. Le Guel (2005), “P2P Music Sharing Networks: Why the Legal Fight against Copiers may be Inefficient,” *Review of Economic Research on Copyright Issues*, 2(2), 69-82.
- Slive, J. and D. Bernhardt (1998), “Pirated for Profit,” *Canadian Journal of Economics*, 886-899.
- Thaler, R. (1983), “Transaction Utility Theory,” in R.P. Bagozzi, A.M. Tybout and Ann Abor (eds), *ACR North American Advances*, 10, 229-232, MI: Association for Consumer Research.
- _____ (1985), “Mental Accounting and Consumer Choice,” *Marketing Science*, 4(3), 199-214.
- Urbany, J.E., W.O. Bearden, A. Kaicker, and M. Smith-de Borrero (1997), “Transaction Utility Effects when Quality is Uncertain,” *Journal of the Academy of Marketing Science*, 5(1), 45.
- Wu, S.Y., P.Y. Chen and G. Anandalingam (2003), “Fighting Information Good Piracy with Versioning,” *ICIS 2003 Proceedings*, 51.

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