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## Copyright piracy and education

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**Abstract:** This paper attempts to link different types of copyright piracy and education to check the effect of education on piracy. It focuses on four specific domains of copyright law – cinematography, musical works and sound recording, software and literary works – with a focus on unauthorised copying (duplication), purchasing pirated materials and unauthorised downloading and photocopying of books. For this purpose, a survey was administered to 1,350 students at the University of Delhi. The findings show that both the levels and types of education affect piracy.

**Keywords:** cinematographic piracy; music and sound recording piracy; software piracy; literary piracy; education.

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## 1 Introduction

Copyright piracy is a menace that is negatively affecting the process of innovation. It brings economic loss to the copyright holders and impacts innovation by denying the innovators their legitimate dues and thus negates the creative potential of the society. Perhaps this would be meaningful if Joseph A. Schumpeter wrote about the "The

Innovation Theory of Profit” in contemporary times to imply that an entrepreneur can earn economic profits by innovating and preventing it from piracy.

According to the latest statistics from DataProt (2021), “Digital video piracy is costing the USA content and distribution sectors between \$29.2 and \$71.0 billion each year. The global movie industry’s revenue losses from digital piracy range between \$40 and \$97.1 billion per year. Between 2015 and 2017, the software industry lost \$46.3 billion to piracy theft” (dataprot.net, 19/03/2021).

The 2017 global piracy report by MUSO suggests that there were 73.9 billion visits to piracy sites catering to music. Further, MUSO recorded 300 billion visits to different piracy sites which show the popularity of piracy (digitalmusicnews.com 22/03/2018). The global online piracy is costing the USA economy \$29.2 billion revenue loss each year (Blackburn et al. 2019). Copyright piracy is actually being treated as a serious offence around the world.

The case of India is no different. India offers a huge and growing market for activities that come under the purview of copyrights. While the ambit of copyright laws is huge, we focus on four specific domains of the law, i.e., cinematography, musical works and sound recordings, software and literary works<sup>1</sup>. These domains together account for the bulk of the value creation related to copyrights. India has an ever-growing entertainment market, as is seen from the number of films produced in the country. Nearly 1,500 movies are produced every year in various Indian languages, which is far above the 700 or so movies made in the United States annually (qz.com, 26/09/2016). The country also witnessed substantial growth in the computer software industry, which is seen from the fact that the Indian information technology (IT) industry’s contribution to GDP improved from 1.2% in 2009 to 7.7% in 2017 (NASSCOM Report, 2017). India is also among the top publishing nations of the world. According to a 2013 report published by the German Book Office in New Delhi, India publishes about 90,000 titles every year.

Even though India is amongst the leading countries in activities that require, and indeed use, copyright protection, it is also an indisputable fact that copyrights are routinely violated in all these different markets. We present some data to highlight the problems caused by piracy. Evidence shows that while the Indian film industry earned US\$ 2 billion from legitimate sources in 2016, its revenue loss from movie piracy alone was pegged at \$2.7 billion (thenewsminute.com, 21/08/ 2016). It is estimated that the illegal streaming and downloading of movies caused a monetary loss of Rs. 18000 crores in 2016–2017 and is expected to grow and outrun the Indian cinema industry (Trak.in, 08/02/2019). For example, movies like *Kabali*, *Great Grand Masti*, *Uda Punjab* were available for download on torrent sites even before their official release on the big screen (thehindu.com, 27/08/2016). In the year 2015, the movie *Bahubali* took the biggest hit with 1485 active piracy links resulting in illegal downloading about 2.5 million times, which resulted in a loss of nearly Rs. 1064 crores (Businessinsider.in, 17/08/2016). The Hindi movie *Kaminey* was downloaded over 350,000 times on Bit Torrent (internet website), with two-thirds of the downloaders being located in India (Trak.in, 17/02/2010), resulting in enormous losses to the producers. On offline piracy, Ernst and Young’s 2008 Report noted that piracy led to a loss of about \$959 million and 5,71,896 jobs to the Indian film industry. Finally, India had supposedly lost around \$2.5 billion due to software piracy, according to the Business Software Alliance reports of 2016 and 2018; while the loss of genuine book sales proceeds due to book piracy stood at Rs. 83,340 million in 2011 (telegraphindia.com, 10/07/2014). These figures point out that copyright piracy, especially in the Indian context, needs to be examined in details.

There is a dearth of literature (probably none) on factors explaining copyright infringements from the end user perspective in Indian case. This motivates us to fill up the lacuna and provide a detail study of the factors affecting copyright infringements in the Indian case. This serves well to form the theoretical framework for our study. While one can focus on several competing explanatory factors behind the phenomenon of piracy, in this study we choose to focus on the relationship between different types of copyright piracy and education to check the effect of education on piracy, controlling for other factors. This study is based on the survey of a large sample of students from the University of Delhi. The reason for choosing students' population comes from the belief that piracy is mostly committed by students (Hinduja, 2003; Chiou et al. 2005; Gan and Koh, 2006; Malin and Fowers, 2009; Goode, 2010) who have low or no income, significant amount of leisure time and no reputation at stake (Sims et al. 1996; Proserpio et al. 2005). There is literature (Marron and Steel, 2000; Depken and Simmons, 2004; Fischer and Andrés, 2005; Fraj and Lachhab, 2015) which have used income as the main explanatory variable, though the results are varied. We overlooked this component and have rather preferred to control it since in this group; there are not many income earners as they are dependent on parents' income.

Further, we carried out an economic analysis of piracy which explains the differences in piracy counts across different students based on their types (faculties of enrolment) and level (Graduation, Post-graduation and Research) of educational degree, after controlling for other factors. We carried out the same analysis across the four chosen domains of copyright laws. The analysis is further segregated by the types of copyright infringement (illegal downloading, unauthorised duplication and purchasing of pirated products) for each domain of copyright under study. This segregation might explain why and which of the factors have a greater effect than others in explaining different forms of piracy, adhering to the resource-based view (Lockett et al. 2009; Schauerte et al. 2021).

Important findings of the paper are: The students enrolled in postgraduate courses and researchers are less inclined towards cinematography, musical works and sound recording, and literary piracy, except for software piracy by researchers. Students in the faculties of Medical Sciences, Science and Technology, Social Sciences and Commerce are less inclined towards cinematography, and musical works and sound recording piracy. There is a strong liking for software and literary piracy (illegal downloading and unauthorised copying) among the medical students. Further, we observe that Arts students outweigh those from other streams, especially in terms of photocopying of books.

The scheme of the study is as follow: Section 2 covers literature review, followed by discussion on methodology and variables in Section 3 and Section 4, respectively. The results are discussed in Section 5, followed by conclusion and policy implications in Section 6. However, before proceeding further, it is important to understand the Indian copyright laws and their provisions towards copyright infringements.

## **2 The copyright law in India**

Are India's copyright laws strong enough to deter the phenomenon of piracy? To understand this, we present a brief review of the copyright laws in India. The British Copyright Act, 1911 was extended into India in the form of Copyright Act of 1914. Thereafter, the Copyright Act 1957, considered to be the most exhaustive and well

defined in terms of the areas covered, gave exclusive rights to the owners to make, sell or rent out a copy, to execute or commune the work in open, and make changes to the work (Chapter III, clause 14, Copyright Act, 1957). However, with subsequent amendments, the Copyright Act was made compliant with the Berne Convention of 1886 (which was later modified in 1971 in Paris), the Universal Copyright Convention 1952, the Rome Convention 1961, and most recently the trade related intellectual property rights (TRIPS) agreement 1995. Major amendments were made to the Copyright Act in 2012, which made it compliant with the world intellectual property organisation (WIPO) copyright treaty, and the WIPO Performances Arts and Phonograms Treaty of 2002. This was done to protect the copyright owners, performers and producers of phonograms in this digital era. Further, the Copyright Act was brought in accord with two other WIPO treaties, namely the Beijing Audio-Visual Performers Treaty 2012 and the Marrakesh Treaty of 2013, so that the visually impaired and/or print disabled persons could access published work.

With the above information on India's copyright laws as they stand, we now proceed to understand what action(s) of an individual(s) constitutes piracy or violations of the laws. The infringement of Copyright Act (clause 51, chapter XI, Copyright Act, 1957) states that when any person does anything which is the restricted right of the copyright owner, then this will amount to violation of the law. The act gives a list of activities which exclusively belong to the copyright owner.

However, clause 52, chapter XI of the Copyright Act 1957 specifies certain exemptions, of which we point out some important ones below:

- a Under the concept of 'fair dealing', any work, except a computer programme, may be stored in any electronic medium, including the associated storage of the computer programme for private/personal use including research, and it is not considered an infringement. For example, one can save a copy of the original DVDs onto one's laptop/desktop.
- b Making backup copies of computer programmes as a temporary protection against loss.

In recent times, an important observation on copyright perspective was provided by Justice Gautam Patel's Mumbai High Court ruling of September 2016 that for online viewing only, even pirated materials do not constitute a crime in India. In his words,

"The offence is not in viewing, but in making a prejudicial distribution, a public exhibition or letting for sale or hire without appropriate permission copyright-protected material ... Infringing or abetting infringement of copyright-protected content ... is an offence in law. Sections 63, 63-A, 65 and 65-A of the Copyright Act, 1957 read with Section 51 prescribe penalties of a prison term of up to 3 years and a fine of up to Rupees 3 lakh". (timesofindia.indiatimes.com, 05/09/2016).

### **3 Literature review**

There are lots of studies dealing with factors which can help explain copyright infringements. The factors include a mix of ethical, economical, lawful and psychological factors. Our study in fact, is a contribution to the above body of literature. However, the prior literature on piracy is primarily based on descriptive surveys, analytical modelling

and conceptual discussions with limited empirical studies. This study based on a large sample, utilises multi-stage proportional stratified sampling and carry out an analysis of piracy across four different domains of the copyright law, which is based on students' different educational degree levels and their types. This study of copyright piracy to the best of our knowledge is something first for India, not only in terms of methodology, but also interpretation and quantum of work as it includes a much broader definition of piracy and covers different domains of Copyright Act. We briefly present review of the related literature.

Pham et al. (2020) examined the factors affecting digital piracy in Vietnam. Their results show the importance of perceived behavioural control as one factor which influences intention and then piracy. Hossain et al. (2019) finds that awareness about piracy and its legal implications is the most important factor determining a person's behaviour towards piracy. Hinduja and Higgins (2011) explain the demographic profiles of undergraduate students of a university in the USA who are involved in music piracy. They also establish internet proficiency and variety can explain involvement in such activity. Nandedkar and Midha (2011) explain the prevalence of piracy through the concept of optimum biasness<sup>2</sup> (a model in psychology), despite high risk associated with it. Teston (2008) points out that the differences in the moral construct of pro-piracy and anti-piracy students are not because of different moral reasoning but due to a flawed concept of innovator's rights on the product beyond a time frame. Chiang and Assane (2007) explained the role of gender and its response towards risk and economic incentives.

The initial strands of literature on software piracy were kind of descriptive surveys covering practices and attitudes of professionals and students. Straub and Collins (1990), Shim and Taylor (1988, 1989), Oz (1990), Solomon and O'Brien (1990), Paradise (1990), Kievit (1991), Christensen and Eining (1991), Peace (1997) and Sims et al. (1996) all find related results with student populations.

Gopal and Sanders (1997, 1998, and 2000) and Thong and Yap (1998) provide a model-based approach of understanding piracy. Seale et al. (1998) used a structural model based on the theory of planned behaviour<sup>3</sup> (Ajzen 1985) and theory of reasoned action<sup>4</sup> (Vallerand et al. 1992). Jabri and Gader (1997) developed a model for Saudi Arabia, based on differential association theories<sup>5</sup> and reasoned action, to associate the role of individual and peer belief on piracy.

Apart from the above, there are also studies which suggest that piracy may not necessarily be detrimental to the industry as projected by other studies (Takeyama, 1994; Liebowitz, 1985; Muller et al. 1995).

#### **4 Methodology and specification issues**

The above legal perspectives were briefed to the respondents before the respondents were asked to fill up the questionnaire. The survey was conducted in the north campus colleges of the University of Delhi, from October 2017 to September 2018. The total sample size is 1,350. The detailed discussion on sampling is provided in appendix (available on demand). Table 1 shows the specific domains of Copyright Act under the study, and the variables we look at in the survey.

**Table 1** Copyright domain and specific sectors of interest

Copyright domain	Specific sector
Cinematography	Movies
Musical works and sound recording	Audio songs
Software	Software
Literary works	Books, e-books

We formulated the following equation for estimation to be used separately for each copyright domain under study, i.e., for movies, audio songs, software and books respectively:

$$Piracy_i = \alpha_1 + \alpha_2 Education_i + \alpha_3 X_i + \varepsilon_i \tag{1}$$

where  $i$  stands for individual.

Here,  $Piracy_i$  is the piracy committed by an individual  $i$  with respect to movies, music software and books respectively;  $Education_i$  is the level (graduation, post-graduation and research) and types (faculties of enrolment) of education in which the student is currently studying;  $X_i$  is the vector of controls; and  $\varepsilon_i$  is the random error term. The detailed explanation of each of the variables is in the next section.

We use the usual ordinary least square method (OLS) to estimate equation 1. However, the problem with equation (1) is of omitted variables, thus generating the problem of endogeneity in the model. For example, the level of education is very much related to unobservable factors like person’s IQ, social background, motivation, character and temperament traits, and these factors also affect a person’s behaviour towards piracy. Therefore, any correlation between piracy and students’ level of education could be because of unobservable factors rather than a causal relation between the two. Therefore, we also use instrumental variable regression where we use parents’ education as an instrument for the level of education of students (see Table 3). A brief discussion on instrumental variable regression is as follows. We used a simple model to describe this approach:

$$y = \beta_0 + \beta_1 x + u \tag{2}$$

In equation (2), we assume that  $Cov(x, u) \neq 0$  and therefore, ordinary least square (OLS) method will not work. In order to get consistent  $\beta_0$  and  $\beta_1$ , we introduced a new variable  $z$  which is observable and satisfies the following two assumptions:

$$cov(z, u) = 0 \tag{3}$$

$$cov(z, x) \neq 0 \tag{4}$$

We have used the term  $z$  as the instrumental variable for  $x$ . The first assumption equation (3) implies that  $z$  is exogenous in equation (2). In terms of omitted variables, instrument exogeneity means that  $z$  is expected to have no biased effect on  $y$ , and it should be uncorrelated with omitted variables. Equation (4) implies that  $z$  is associated with the explanatory variable  $x$ . This is also referred to as instrument relevance.

We generally cannot test equation (3) because it involves association between  $z$  and the unobservable error term  $u$ , therefore, in majority of cases, this is tested by engaging

introspection. Equation (4) can be tested simply by regressing  $x$  on  $z$  and then testing the significance of the coefficient on  $z$ .

In order to identify parameter  $\beta_1$ , i.e., to write  $\beta_1$  in terms of population moments, we use equation (2) to express the co-variance between  $z$  and  $y$  as:

$$\text{cov}(z, y) = \beta_1 \text{cov}(z, x) + \text{cov}(z, u) \quad (5)$$

Further, with the use of both the assumptions in equations (3)–(4), we solve for:

$$\beta_1 = \text{cov}(z, y) / \text{cov}(z, x) \quad (6)$$

Now, given the sample that is random, the population quantities are estimated using sample analogues. Therefore, the instrumental variable (IV) estimator of  $\beta_1$  is obtained after sample sizes in both the numerator and denominator get cancelled:

$$\beta_1^- = \frac{\sum_{i=1}^n (z_i - z^-)(y_i - y^-)}{\sum_{i=1}^n (z_i - z^-)(x_i - x^-)} \quad (7)$$

Using the law of large numbers, it can be shown that the IV estimator of  $\beta_1$  is consistent, provided equations (3)–(4) are satisfied.

#### 4.1 *Dependent variable – piracy*

The dependent variable of interest in equation (1) is piracy committed by an individual (Piracy). We collect data on this variable by asking the respondents about the number of unauthorised downloads, unauthorised (physical) copies and number of pirated copies purchased over three months prior to the survey. Each of the above violations (in terms of copyright) constitutes a different dependent variable for each domain of copyright under study. To elucidate, for movie piracy, we test equation 1 for three different dependent variables in the form of number of (unauthorised) movies downloaded, number of (unauthorised) movies copied, and number of pirated movies purchased. The same process is repeated for other domains of copyright under study. These violations are explained below:

##### 4.1.1 *Unauthorised downloads*

This constitutes all downloads that are done through file sharing via peer-to-peer networks and streaming through illegal sites where movies, songs, software and e-books are uploaded illegally and no subscription or user fees are paid for the use of copyright protected contents.

##### 4.1.2 *Unauthorised copying*

This refers to the duplication of books, compact discs (CDs), digital video discs (DVDs) and software, without due authorisation, whether for personal use or for rental or sale. However, if a person purchases an original CD or DVD of movies or songs and makes a copy of that original as a measure of protection against any loss or stores it in any electronic medium for similar purpose, then that is not considered piracy. To clarify



further, if a person purchases an original movie or audio CDs/DVDs, books or software, makes a copy of that original and then lend the duplicated copy to friends or relatives, then this is considered piracy, because duplication of the copyright work has been done for which the copyright holder was not paid any fees. However, if this individual lends the original CD or DVD to others without making a copy, then that does not constitute a violation of the copyright law, because the copyright holder has already received fees for the use of the original content.

#### *4.1.3 Purchasing pirated CDs/DVDs*

Even though a person who purchases pirated material may not be directly involved in making or selling the pirated CDs, DVDs or books, that person becomes a partner in crime by participating in the distribution of illegal copies, and thus is guilty of abetting the infringement of copyright protected materials.

#### *4.1.4 Photocopying most/whole book*

Apart from the above three, we add this additional violation with respect to books. Under international copyright law, one cannot photocopy a full book or even a major part of it. In India, however, ambiguity prevails about this aspect due to recent developments that we discuss below.

The September 2016 judgement of the Delhi High Court on '*The Chancellor, Master and Scholars of the University of Oxford and others. Vs Rameshwari photocopy services and others*', considered how much of a book could be photocopied with the purpose of research or teaching. This became a contentious issue due to the fair dealing provisions of the prevailing Copyright Act, which say that the work can be reproduced by a teacher or a pupil for instructional purposes, as well as for the purpose of setting examinations. This case revolved around what constitutes an instruction process, what is the role of the photocopy shop in question (which operated from the premises within the University of Delhi), production of course packs<sup>6</sup> and the non-subscription of University of Delhi to the Indian reprographic rights organisation (IRRO). The first judgement in September 2016 ruled in favour of the defendant citing "copyright in a literary work is not an inevitable, divine or natural right which is conferred on an author". It further stated that the copyright act is built to promote knowledge and creations. The second judgement in December 2016 restored the petition of the publishers and directed the photocopy shop to keep records of the course packs photocopied, and to submit semi-annual statements to the court; but, at the same time, maintained the status quo between the two parties. This case did not make any headway into the problems emphasised above, and the publishers subsequently withdrew their petition. So, in our analysis, we take photocopying of the majority or whole book as a violation of the Copyright Act in India.

Table 2 sums up the types of piracy existing in the areas of cinematography, musical works and sound recordings, software and literary works, and also gives us different dependent variables<sup>7</sup> on which we test equation (1).

**Table 2** Different forms of piracy under each copyright domain (dependent variables)

Movie piracy	Unauthorised downloading of movies
	Unauthorised copying (duplication) of movies
	Purchasing pirated copies of movies
Audio songs piracy	Unauthorised downloading of audio songs
	Unauthorised copying (duplication) of songs
	Purchasing pirated copies of audio songs
Software piracy	Unauthorised downloading of software
	Unauthorised copying (duplication) of software
	Purchasing pirated copies of software
Books/e-books piracy	Unauthorised downloading of e-books
	Unauthorised copying (duplication) of e-books
	Purchasing pirated copies of books
	Photocopying of books

## 4.2 Independent variables

### 4.2.1 Education level of students

Further, as given in equation (1), we now discuss the education level of the students. We capture this variable in terms of the current enrolment status of students, i.e., whether they are undergraduate students, master's students, or research (MPhil or PhD) students. The idea behind this categorisation is to look at how different levels of education are related to piracy, and whether this relationship varies between various copyright domains. Note, that a priori, these relationships are not clear cut. For instance, it makes sense to argue that the research students may exhibit lower piracy rates because of greater awareness of piracy laws and perhaps greater maturity, but on the other hand, research students have greater need of software which they may not be able to afford, and therefore may be forced to indulge in greater piracy. Or it may be the case that research students may resort to piracy of books and journals at a greater level, since they need to study substantial amounts of literature in their respective fields of research, which implies relatively greater reliance on photocopied materials. It also makes sense to argue that the undergraduate students may exhibit greater tendency towards cinematographic and audio piracy, because they cannot afford the fairly highly priced movie tickets or music CDs and DVDs, given that they receive limited amounts of pocket money. We define *EDU\_GRAD*, *EDU\_PG* and *EDU\_RESEARCH* as dummy variables taking value 1 if the student is currently enrolled in graduation, post-graduation and research respectively; otherwise takes a value 0. *EDU\_GRAD* is the benchmark variable.

### 4.2.2 Types of enrolment

One can hypothesise that since the cost of education is higher in the fields of Science and Technology, and Medical Sciences, these students are more prone to piracy as compared to those from Arts, Humanities and the Social Sciences. However, one may also postulate that the students from the Faculty of Arts are relatively more involved in literary piracy. This is based on the belief that the departments like English, Hindi, Political Science and

Linguistics among others require large volumes of literary books and novels, and not everyone can afford to buy all of them, and thus this may lead to greater literary piracy. Or is it the case that the students from the faculty of medical sciences and social sciences are more involved in literary piracy given the extant nature of their departments. We can delve into one more such relationship which says all or none are involved in piracy. Therefore, to account for differences in the cost of education and nature of the faculties, we include six dummy variables for these different groups of faculties, which are FAC\_SOC\_SS, FAC\_ARTS, FAC\_MS, FAC\_S&T, FAC\_COMM and FAC\_LAW. These dummies represent the Faculty of Social Sciences, Arts, Medical Sciences, Science and Technology, Commerce and Law respectively. For example, the dummy variable FAC\_SOC\_SS takes a value of one if the student is enrolled in any of the departments under the Faculty of Social Sciences; otherwise takes a value zero. The dummy variable FAC\_ARTS takes a value of one if the student is enrolled in any of the departments under the Faculty of Arts; otherwise takes a value zero. The same process is repeated for other faculties. The details of these respective faculties are presented in the appendix (available on demand).

Another variable is the enrolment of students in regular courses versus non-regular courses. So, we create a dummy variable non-regular which takes a value one if the student is enrolled in non-regular courses; otherwise takes a value zero. The University of Delhi offers non-regular degree courses from the school of open learning (SOL) and non-collegiate women education board (NCWEB) which offer degree courses only to women. The students who are enrolled in regular degree courses, degree courses at SOL and degree courses at NCWEB are presumed to be distinct in their approach towards piracy. One can postulate lower literary piracy for students enrolled in non-regular courses as these courses are academically less demanding than regular courses and moreover, students in non-regular courses very much rely on 'kings champion' guidebooks for any literary gains. Also, part-time or full-time jobs are usual features of non-regular students which imply less time for leisure related activities and thus, we expect lower piracy from the students enrolled in non-regular courses.

#### *4.2.3 Control variables*

A number of control variables are also employed refer to equation (1) in this study. Piracy rates may vary by gender. Chiang and Assane (2007) explain the role of gender and its response towards risk and economic incentives. They find greater engagement of MALE students in piracy. The female students are inclined to shell out for legal alternatives and have higher risk perceptions, and thus, tend to be risk averse. So, we define variable MALE = 1 if respondent is a MALE, and = 0 if female or transgender, and expect that males exhibit greater engagement in piracy.

Piracy rates may vary by age (AGE). Age is taken to reflect the experience and maturity of the individual. Older individuals are supposedly more mature and more conscious of laws, and thus may be expected to be less engaged in piracy. Sims et al. (1996) and Shim and Taylor (1988, 1989) find less engagement of older cohorts in piracy.

The income of the respondent (INCOME) plays an important role in determining his/her engagement in piracy. We looked at all the possible sources from where students get their monetary resources. We posed a range of questions about monthly pocket money from parents, the amount of scholarship (if any) that students receive, the amount

of money that students make doing jobs, and the amount of money that students may receive from their spouse or others. Revenues from all these sources were added up to create this continuous variable. The ex-ante hypothesis is that the students possessing greater monetary resources are less inclined toward piracy, as they can afford to pay for the copyright protected materials. We also included the squared term of income or INCOME2 as a regressor to check for any non-linear relationship between copyright piracy and income.

We further believe that access to gadgets is important for engagement in piracy as it provides a facilitating tool for watching movies or listening to music. Therefore, we have introduced a dummy variable 'GADGETS' which takes a value of one if the student owns a personal laptop/desktop; and takes value zero otherwise. We expect a positive relationship between piracy and access to gadgets.

Another concern while dealing with the student population is if language can be a barrier to piracy. So, we asked each respondent about the language in which they prefer to write their exams, and we created a dummy variable LANG\_HINDI which takes value one if the student prefers to write his/her exam in Hindi language and takes value zero otherwise. The ex-ante hypothesis is that the students who are more comfortable in Hindi are less engaged in online piracy<sup>8</sup>, because the bulk of material available on the internet is in English, whereas language is not an issue when it comes to 'offline' piracy<sup>9</sup>.

**Table 3** Correlation between parents' and students' education (in percentages)

<i>Student's current enrolment</i>	<i>Mother's education</i>		
	<i>Higher secondary</i>	<i>Graduation</i>	<i>Post-graduation and above</i>
Graduation	89.24	9.26	1.49
Post-graduation	15.98	75.34	8.68
Research	10.24	12.60	77.17
<i>Student's current enrolment</i>	<i>Father's education</i>		
	<i>Higher secondary</i>	<i>Graduation</i>	<i>Post-graduation and above</i>
Graduation	51.10	37.25	11.65
Post-graduation	27.85	47.95	24.20
Research	33.86	40.15	14.15

Further, one may exhibit piracy behaviour under the influence of peers. To control for peer pressure, we introduced an imperfect proxy, i.e., we asked the respondents whether they 'accept', 'are offended' or have 'no comments' with regard to a large number of fellow students around them who download pirated music/movies/software/books online and share it with other people. Approximately 69% accepted this behaviour, 4% felt offended and remaining 27% did not offer any comment. We introduced three dummies – PEERPIRACY\_ACCEPT which takes the value of one, if the respondent accepts peer piracy, zero otherwise; PEERPIRACY\_OFFEND which takes the value of one if the respondent is offended by peer piracy, zero otherwise; PEERPIRACY\_NOCOMMENTS which takes the value of one if the respondent offers no comments on peer piracy, zero otherwise. Since this is an imperfect proxy, we use it cautiously (see Table 9).

**Table 4** Variables (independent) summary

<i>Independent variables</i>	<i>Code</i>	<i>Definition</i>
Education levels	EDU_PG	Dummy variable taking value one if the student is enrolled in PG course; zero otherwise
	EDU_RESEARCH	Dummy variable taking value one if the student is enrolled in Mphil/PhD course; zero otherwise
Types of enrolment	NON-REGULAR	Dummy variable taking value one if the student is enrolled in non-regular courses; zero otherwise
	FAC_SOC_SC	Dummy variable taking value one if the student is enrolled in faculty of social sciences; zero otherwise
	FAC_MS	Dummy variable taking value one if the student is enrolled in faculty of medical sciences; zero otherwise
	FAC_S&T	Dummy variable taking value one if the student is enrolled in faculty of science and technology; zero otherwise
	FAC_COMM	Dummy variable taking value one if the student is enrolled in faculty of commerce; zero otherwise
	FAC_LAW	Dummy variable taking value one if the student is enrolled in faculty of law; zero otherwise
Controls		
Gender	MALE	Dummy variable taking value one if the student is a male; zero otherwise
Income of the respondent	INCOME	Continuous variable
Income of the respondent2	INCOME <sup>2</sup>	Continuous variable
Language	LANG_HINDI	Dummy variable taking value one if the student prefers to write exams in Hindi language
Access to gadgets	GADGETS	Dummy variable taking value one if the student has a personal laptop/desktop

We have included two more variables as instruments for the level of education in which the student is currently enrolled. The variables are father's education (FATHERS\_DUM) and mother's education (MOTHERS\_DUM). So, we created three dummies each for both parents, based on their level of education, i.e., if it is up to higher secondary or graduation or post-graduation and above. We feel that the parents' level of education is closely related to students' level of education as seen by the diagonal elements in Table 3 which present the education level of both parents against the student's current enrolment in different degree courses; moreover, these instruments are also uncorrelated with the error term in equation (1), thus satisfying both the criteria for a good instrument variable. The independent variables are summed up in Table 4.

## 5 Estimation results

We started with lot of explanatory variables like academic performance of respondents and whether the respondent did his/her secondary schooling from government or non-government school (10th schooling), but then we dropped them because they remained insignificant for all the regressions (results not shown), and the variable age of the respondent (AGE) was dropped due to the problem of multi-collinearity as it is found to be correlated with the level of education of respondents. We also tested a few interaction terms but they were not adding much to the significance of the model, thus we dropped them from the regression framework to prevent loss of degree of freedom. Finally, we got a set of 13 explanatory variables for carrying out the regression analysis.

We computed the DFBETA statistic to perform the outlier test, and few observations which were found to be influential and having high leverage were dropped. Further, we used White heteroscedasticity consistent errors to deal with the problem of heteroscedasticity. Since the regressions are based on dummy variables, the benchmark category consists of females enrolled in regular graduate courses in the faculty of arts whose preferred language is English for all the models in this section.

### 5.1 Cinematographic piracy

We have used unauthorised copying (duplication) of movies, purchasing pirated movies CDs/DVDs and unauthorised downloading of movies to capture the piracy prevailing in the area of cinematography with regard to the Copyright Act. The predominant form of Cinematographic Piracy is unauthorised copying of movies where 80% of the respondents agreed to have done this form of piracy, whereas only 8% and 40% agreed to have purchased pirated movie CDs/DVDs and resorted to unauthorised downloading of movies respectively in the last quarter measured from the date of the interview. Table 4 explains four models whose dependent variables are: number of (unauthorised) movies copied, number of pirated movies purchased, number of (unauthorised) movies downloaded and total number of pirated movies (adding up the previous three) respectively. The dependent variables are based on the quarterly responses of the respondents.

We have observed that the researchers show lower inclination towards cinematographic piracy as visible from negative and significant coefficient on EDU\_RESEARCH in the first three models, in comparison to the benchmark group. The coefficient on EDU\_PG reflecting students enrolled in post-graduate courses is insignificant (model 1 and 3) except for the negative significant coefficient in model 2. The behaviour of both can be explained in terms of maturity and course requirements. The younger cohorts of students in graduation are more exploratory in terms of their behaviour towards legal and illegal contents, and this often results in engagement in piracy in order to do away with the income constraints which the students may have. The course structure at the level of graduation also does not possess any limiting constraints on amusements.

With maturity, people tend to be more cautious in their approach towards dealing with subjects which involve violation of the law. This along with the fact that the syllabus and evaluation process of research and post-graduation courses are designed in such a way that it requires much more engagement of the students, and thus, they are left with less time for leisure related activities and hence, less engagement in piracy. Therefore, cinematographic piracy is higher for younger age cohorts and lower for people in higher age brackets.

The students in non-regular courses are less involved in cinematographic piracy in comparison to students in the benchmark category (as observed by negative and significant coefficient on non-regular in models 1 and 3). We can give a two-fold explanation for such an observed behaviour. Most of the non-regular students come from poor socioeconomic status (less endowed households) and are probably more involved in other aspects like jobs which leave them with less time for leisure related activities, and thus less engagement in piracy.

The social sciences and medical students (models 1 and 2), science and technology students (models 1 and 3), and commerce students (model 2) are less inclined towards cinematographic piracy as observed by negative and significant coefficients on their respective dummies, in comparison to students in the benchmark. This is probably because more strenuous and cumbersome course structures in these faculties allow students less time for leisure related activities, and thus less engagement in the piracy. Interestingly, it is the Faculty of Law which surpasses all other faculties with regard to cinematographic piracy (models 1 and 3). The reason can be two-fold: knowing the law makes it easier to play around it and secondly, the guidebooks like 'bare acts'<sup>10</sup> enormously reduce the academic burden on law students, thereby leaving them with ample time for amusements, and thus more engagement in piracy is seen.

Further, males are more inclined towards cinematographic piracy in comparison to benchmark respondents. This is in line with earlier literature (Sims et al. 1996; Vallerand et al. 1992), but in contrast to the findings of Amodu et al. (2020) where gender was an indifferent issue. This suggests that males are more of risk takers as seen by the positive and significant coefficient on MALE in models 1 and 3, reflecting their inclination towards copying and downloading illegal contents. This view is also supported by Chiang and Assane (2007).

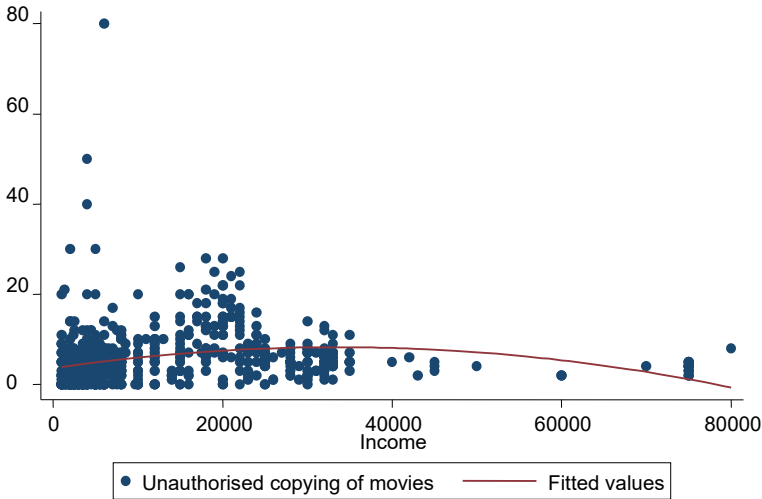
The role of the students' income in explaining cinematographic piracy is less in value but high in significance. There is more inclination towards illegal copying of movies at lower level of income as observed by positive and significant coefficient on INCOME (model 1). This is expected as the pirated materials are less costly and provide a more viable option of watching a movie for students with lower individual income. However, at higher level of income, any such inclination is phased out as we observe negative and significant coefficient on INCOME2 (models 1 and 3), i.e., an individual is more inclined to buy copyright protected material and he/she does not mind paying for it in full. So, we clearly observe a non-linear relationship or more of an inverted 'U' shaped curve relationship between the income of the respondents and piracy (Figure 1). Therefore, the threshold level of income<sup>11</sup> is around Rs 25,000 where the relationship between income and piracy changes from positive to negative, i.e., people prefer to buy copyright protected materials whose income is over and above the threshold level of income.

**Table 5** Cinematographic piracy

	Dependent variables			
	Number of movies copied Model (1)	Number of pirated movies purchased Model (2)	Number of pirated movies downloaded Model (3)	Total number of pirated movies Model (4)
EDU_PG	-0.3099 (0.1023)	-0.3427*** (0.1163)	-0.3092 (0.9376)	-1.3483 (1.7051)
EDU_RESEARCH	-3.4197*** (1.1018)	-0.4258* (0.2544)	-3.7142*** (1.1701)	-8.3326*** (2.0776)
NON-REGULAR	-2.0524* (1.0501)	0.1460 (0.1765)	-4.1546*** (0.8720)	-2.2640** (1.0816)
FAC_SOC_SC	-1.8524** (0.9427)	-0.2622* (0.1486)	-1.6040 (1.0018)	-1.9674** (0.9368)
FAC_MS	-3.1442** (1.2556)	-0.6499*** (0.2072)	-2.5724 (1.6335)	-3.4522** (1.4851)
FAC_S&T	-2.3008* (1.1797)	-0.1344 (0.2562)	-2.7195*** (1.0430)	-5.2678*** (1.9950)
FAC_COMM	-0.2760 (0.4035)	-0.1853** (0.0914)	-0.1673 (0.3297)	-0.1133 (0.4647)
FAC_LAW	3.3372*** (1.3588)	0.0641 (0.3037)	3.0332** (1.4355)	6.7121*** (2.4868)
MALE	1.2543*** (0.369)	0.1224 (0.0793)	1.0708*** (0.3696)	2.5986*** (0.6440)
INCOME	0.0001*** (0.00005)	-0.00001 (0.00001)	0.00007 (0.00005)	0.0002** (0.0001)
INCOME <sup>2</sup>	2.00e-09*** (5.91e-10)	2.78e-10 (2.09e-10)	-1.02e-09* (5.84e-10)	-2.69e-09** (1.13e-09)
LANG_HINDI	-0.4052 (0.3133)	-0.1788** (0.0787)	0.03855 (0.2221)	-0.5848 (0.4529)
GADGETS	1.5879*** (0.4864)	0.7319*** (0.1533)	2.5454*** (0.4268)	5.0127*** (0.8270)
INTERCEPT	4.9894*** (1.0445)	0.1546*** (0.1743)	3.6795 (0.8397)	8.8884*** (1.6480)
N	1,299	1,336	1,292	1,258
R <sup>2</sup>	0.1336	0.0465	0.2203	0.2292

Notes: \*\*\* 1% significance, \*\* 5% significance, \* 10% significance. Standard errors are in parenthesis.



**Figure 1** Relationship between income and cinematographic piracy (see online version for colours)

Interestingly, students whose preferred language is Hindi are less inclined towards purchasing pirated movies as observed by the negative and significant coefficient on LANG\_HINDI in model 2 than the students whose preferred language is English. The plausible explanation for such behaviour comes from the fact that 95% of the students in our sample with Hindi language as the most preferred language are the ones with lower household income (less than Rs five lakhs/annum), and this might negatively affect their purchasing power. Further, cinematographic piracy increases with the availability of facilitating gadgets like laptop/desktop as can be seen by the positive and significant coefficient on the variable GADGETS in all three models (1, 2 and 3).

We also have a model 4 where we introduce the total number of pirated movies as the dependent variable which was the sum of all three dependent variables in the previous three models. The students enrolled in research courses, non-regular courses, social sciences, medical sciences, science and technology are less inclined towards cinematographic piracy; however, it is the MALE students with gadgets and students enrolled in the faculty of law who are more inclined towards movie piracy. Income shares a non-linear relationship with cinematographic piracy, i.e., higher at lower income level and lower at higher income level.

To answer any concerns arising due to endogeneity, the last column of Table 5 shows the result of the regression of the most dominant form of cinematographic piracy (i.e., number of unauthorised movies copied) in our study, on the instrumented education where we use both the father's and mother's education as instruments for student's level of education. The results are almost the same; therefore, we prefer not to give a detailed explanation again. The researchers, non-regular students and almost all faculties except the law faculty are less inclined towards this form of piracy as compared to the benchmark group. However, males and access to gadgets are positively related to piracy. We also observed a non-linear relationship between income and piracy.

## 5.2 Musical works and sound recording piracy

We have used unauthorised copying of audio songs, purchasing pirated audio CDs/DVDs/ MP3s and unauthorised downloading of audio songs to capture the piracy prevailing in the musical works and sound recording aspect of the Copyright Act. The two predominant forms of piracy under this category are unauthorised copying of audio songs and unauthorised downloading of audio songs where 78% and 73% of the respondents agreed to have done this form of piracy, whereas only 6% agreed to have purchase pirated audio CDs/DVDs/MP3s respectively in the last quarter measured from the date of the interview.

Table 6 explains four models whose dependent variables are number of (unauthorised) audio songs copied, number of pirated audio songs purchased, number of (unauthorised) audio songs downloaded and total number (adding up the previous three) of pirated audio songs respectively.

We observed that the researchers are less inclined towards audio songs piracy as seen by the negative and significant coefficient on EDU\_RESEARCH in models 5, 6 and 7 in comparison to students from benchmark category for reasons of maturity and course requirements, as we explain it in the previous section. Post-graduates also show less inclination towards illegal downloading of audio songs as visible from the negative and significant coefficient on EDU\_PG in model 7.

The non-regular students are less inclined towards illegal copying and downloading of audio songs in comparison to students from benchmark category as visible from the negative and significant coefficient on non-regular in models 5 and 7. This is just a reminder of less endowed household status of non-regular students (93% of the non-regular students are in bottom two categories of household income (less than Rs 5 lakhs/annum) and their involvement in other aspects like jobs and coaching which leaves them with less time for leisure related activities, and thus less engagement in piracy. However, non-regular students are more interested in purchasing pirated audio songs (model 6). The differences in audio songs piracy are immaterial when we take different faculties as explanatory variables. But the only exceptions are the law students – they download more of illegal music (model 7) in comparison to students from the benchmark category. They also show fewer tendency of copying illegal audio songs (model 5).

The males are more inclined towards audio songs piracy as seen by the positive and significant coefficient on MALE, in comparison to the benchmark respondents (models 5 and 6). The negative and significant coefficient on students' income (INCOME) for illegal copying of music (model 5) suggest that students with lower income prefer to copy less of audio songs, which seems contrary to our logic where we expect higher piracy at lower income level. However, this should not be seen alone. We also get a positive and significant coefficient on students' income for illegal downloading of audio songs (model 7) which may well suggest that students even with lower income prefer to download pirated audio songs rather than copying it. This seems logical as the audio songs consume less megabytes and less disk space, and with cheaper mobiles phones and internet plans, this is very much feasible. However, we do observe a negative relationship (model 7) between audio piracy and higher students' income (INCOME<sup>2</sup>) which confirms to our belief that audio piracy is lower at higher level of income. The positive and significant coefficient on GADGETS in models 5, 6 and 7 indicate again the rise in piracy due to availability of gadgets.

**Table 6** Musical works and sound recording piracy

	Dependent variables				
	Number of songs copied (Model 5)	Number of pirated songs purchased (Model 6)	Number of pirated songs downloaded (Model 7)	Total number of pirated songs (Model 8)	Number of songs copied (11-2SLS)
EDU_PG	-2.4955 (2.2123)	-0.2372 (0.1469)	-5.7461*** (2.1747)	-7.1197 (4.7358)	-3.7022 (3.6932)
EDU_RESEARCH	-7.9973*** (2.6525)	-0.3940** (0.1713)	-7.3387*** (2.6508)	-20.9086*** (5.1902)	-12.7845*** (4.2832)
NON-REGULAR	-8.4688*** (2.0422)	0.4972*** (0.1787)	4.5406** (2.0335)	-13.7257*** (3.7526)	-9.1644*** (2.1681)
FAC_SOC_SC	-1.7929 (2.2895)	-0.1444 (0.1830)	-1.4154 (2.5047)	0.0237 (4.9832)	-1.9120 (2.1949)
FAC_MS	-1.7381 (4.0824)	-0.2717 (0.2706)	-0.7337 (3.3073)	-5.1147 (6.9193)	-4.0177 (3.8551)
FAC_S&T	-1.2296 (2.8300)	-0.0567 (0.1841)	-4.1888 (2.9890)	-1.6720 (6.0331)	1.8628 (2.8666)
FAC_COMM	-0.7333 (0.7479)	-0.3816** (0.1250)	-0.6944 (0.7733)	-1.3116 (1.5097)	-0.6013 (0.8659)
FAC_LAW	-6.8671** (2.7159)	-0.0501 (0.1741)	12.8916*** (3.4382)	3.4049 (6.6347)	-7.5892** (3.3169)
MALE	2.2248** (0.8718)	0.2357** (0.1101)	1.2081 (0.9588)	5.9120*** (1.8865)	2.04917** (0.8699)
INCOME	-0.0004** (0.0001)	-0.00001 (0.00001)	0.0004* (0.0002)	-0.0003 (0.0003)	-0.0003** (0.0001)
INCOME <sup>2</sup>	2.60e <sup>-09</sup> (3.62e <sup>-09</sup> )	1.24e <sup>-10</sup> (1.31e <sup>-10</sup> )	-1.27e <sup>-09</sup> ** (4.36e <sup>-09</sup> )	1.91e <sup>-09</sup> (3.31e <sup>-09</sup> )	3.40e <sup>-09</sup> ** (1.56e <sup>-09</sup> )
LANG_HINDI	-1.1605 (0.7392)	0.1534 (0.1538)	0.0466 (0.7696)	-0.7872 (1.6391)	-1.0101 (0.7532)
GADGETS	4.1112*** (1.2689)	1.0626*** (0.2293)	3.3049** (1.4331)	11.6905*** (2.8955)	4.1722*** (1.2770)
INTERCEPT	18.5414*** (2.2688)	-0.2624 (0.1598)	12.6709*** (2.3033)	32.3907*** (3.9366)	18.8648*** (2.2306)
N	1,280	1,337	1,280	1,271	1,293
R <sup>2</sup>	0.1232	0.0634	0.0875	0.982	0.1209/0.4349

Notes: \*\*\* 1% significance, \*\* 5% significance, \* 10% significance Standard errors are in parenthesis.

We also have model 8 where we introduced the total number of pirated audio songs as the dependent variable which is the sum of all three dependent variables in previous three models. The results show that the students enrolled in research courses and non-regular courses are less inclined towards audio songs piracy. On the contrary, it is the males and students with gadgets who are more inclined towards audio songs piracy. Income and different faculties do not share any significant relationship with audio songs piracy.

The last column of Table 6 addresses the endogeneity concern and shows the result of the regression of the most dominant form of audio songs piracy (i.e., number of unauthorised songs copied) in our study, on the instrumented education where we use both the father's and mother's education as instruments for the student's level of education. The results are almost the same; therefore, we prefer not to give a detailed explanation again. The researchers, non-regular students and students from law faculty are less inclined towards this form of piracy as compared to the benchmark group. However, males and access to gadgets are positively related to piracy. We also observe a non-linear relationship between income and piracy.

### 5.3 Software piracy

Here, we use unauthorised copying of software, purchasing pirated software CDs/DVDs and unauthorised downloading of software to capture piracy prevailing in the software aspect of the Copyright Act. The predominant form of software piracy is unauthorised copying of software where 24% of the respondents agreed to have done this form of piracy, whereas only 5% and 23% agreed to have purchased and downloaded pirated software CDs/DVDs respectively, in the last quarter measured from the time and date of the interview.

Table 7 explains four models whose dependent variables are number of (unauthorised) software copied, number of pirated software purchased, number of (unauthorised) software downloaded and total number (adding up the previous three) of pirated software. We find interesting results. It is not the post-graduates but the researchers (as seen by the positive and significant coefficient on EDU\_RESEARCH in models 9 and 11) who are more inclined towards software piracy in comparison to other students in the benchmark which is justified on the basis of greater software requirements in higher studies. In fact, majority of researchers work on software to draw statistical inferences from their datasets, but keeping in mind their high subscription costs, resorting to pirated software then becomes the most viable option. Students from the faculty of medical sciences (models 9 and 11) are more into software piracy in comparison to the students from the benchmark category. This is probably due to greater software requirements and higher educational expenses involved in such streams. We get an insignificant coefficient on the non-regular dummy variable in models 9, 10 and 11 which indicates that the enrolment in regular vis-à-vis non-regular courses is irrelevant for software piracy. The explanation for this is the fact that even non-regular students go for diplomas or short-term job-oriented courses (like learning Tally, Photoshop, GST filings, etc.) where the knowledge of software is a must, thereby increasing the chances of being involved in software piracy since most of them belong to lower socio economic strata. Thus, we do not find any significant difference between regular and non-regular students when it comes to being involved in software piracy. The above three points also mark the point of departure from earlier explanation.

Table 7 Software piracy

	Dependent variables					
	Number of software copied Model (9)	Number of pirated software purchased Model (10)	Number of pirated software downloaded Model (11)	Total number of pirated software Model (12)	Number of software copied (11-2SLS)	
EDU_PG	0.0771 (0.2346)	0.1219 (0.1589)	0.2835 (0.3887)	0.6486 (0.7029)	-0.3181 (0.4534)	
EDU_RESEARCH	4.6931*** (0.5275)	0.0165 (0.2945)	1.8968*** (0.4897)	7.1901*** (1.0723)	6.2480*** (1.0017)	
NON-REGULAR	0.1693 (0.2308)	0.0052 (0.1226)	-0.3815 (0.2656)	-0.1077 (0.4931)	0.3300 (0.2789)	
FAC_SOC_SC	-0.3099 (0.3066)	-0.0201 (0.1203)	-0.5041** (0.2495)	-0.6265 (0.5712)	-0.1006 (0.3834)	
FAC_MS	1.9144*** (0.4343)	-0.0916 (0.1823)	2.4008*** (0.5275)	4.1319*** (0.8821)	2.3105*** (0.5696)	
FAC_S&T	0.4514 (0.3260)	0.2752 (0.2155)	-0.0526 (0.3878)	0.6818 (0.7718)	0.4789 (0.3537)	
FAC_COMM	-0.1529 (0.1022)	-0.0161 (0.0579)	0.1906 (0.1203)	-0.1096 (0.2252)	-0.2293* (0.1278)	
FAC_LAW	-0.1303 (0.3180)	-0.1224 (0.1698)	-0.4247 (0.5107)	-0.9789 (0.8316)	0.5646 (0.5365)	
MALE	0.3119*** (0.1112)	0.0584 (0.0510)	0.3848*** (0.1232)	0.8057*** (0.2277)	0.4015*** (0.1418)	
INCOME	0.00001 (0.00002)	-0.00002** (0.00001)	0.00002 (0.00002)	0.00002 (0.00004)	-8.86e-06 (0.00003)	
INCOME <sup>2</sup>	-4.74e-11 (7.05e-10)	5.35e-10 (4.08e-10)	-2.17e-10 (2.62e-10)	-1.84e-10 (6.59e-10)	-1.18e-11 (5.11e-10)	
LANG_HINDI	-0.1183 (0.1079)	0.0723 (0.0650)	-0.1300 (0.0998)	-0.2457 (0.2077)	-0.2612** (0.1307)	
GADGETS	1.3129*** (0.1222)	0.2850*** (0.0891)	1.0027*** (0.1517)	2.6802*** (0.2808)	1.3984*** (0.1413)	
INTERCEPT	-0.2545 (0.2423)	0.1128 (0.1293)	0.1039 (0.2614)	-0.1350 (0.5041)	-0.2512 (0.2686)	
N	1,280	1,321	1,320	1,290	1,302	
R <sup>2</sup>	0.4737	0.0317	0.2662	0.4005	0.4533/0.5347	

Notes: \*\*\* 1% significance, \*\* 5% significance, \* 10% significance. Standard errors are in parenthesis.

We find similar results for males i.e., they are more engaged in software piracy in comparison to benchmark respondents as seen by the positive and significant coefficient on MALE in models 9 and 11. The unauthorised copying and downloading of software are insignificant with respect to the income categories of students (INCOME<sup>2</sup>), which suggest that unauthorised copying and downloading of software require skills, and probably income has no role to play in it. The coefficient on GADGETS is positive and significant in models 9, 10 and 11. We again suggest that access to gadgets is important for piracy. The language as a barrier is not visible in the case of software piracy.

We also have model 12 where we introduce the total number of pirated software as the dependent variable which is the sum of all three dependent variables in the previous three models. The results show that the students enrolled in research courses, medical sciences students, students with gadgets and males are more inclined towards software piracy. Income and enrolment in regular/non-regular courses share no significant relationship with software piracy.

The last column of Table 7 deals with the endogeneity concern and shows the result of the regression of the most dominant form of software piracy (i.e., number of unauthorised software copied) in our study on instrumented education where we use both the father's and mother's education as instruments for the student's level of education. The results are almost the same; therefore, we prefer not to give a detailed explanation again. The researchers and students from medical sciences are more inclined towards this form of piracy as compared to the benchmark group. Even males and access to gadgets are positively associated with this form of piracy. However, income and non-regular students demonstrate no association with software piracy. Hindi language also proved to be a barrier to this form of piracy.

#### 5.4 Literary piracy

To explain literary piracy, we use unauthorised copying of e-books, purchasing pirated books, unauthorised downloading of e-books and photocopying of books to capture literary piracy under the Copyright Act. The predominant form of literary piracy is photocopying of books where 88% of the respondents agreed to have done this form of piracy, whereas only 45%, 38% and 35% agreed to unauthorised copying of e-books, unauthorised downloading of e-books and purchasing pirated books respectively in the last quarter measured from the date of the interview.

Table 8 explains five models whose dependent variables are number of (unauthorised) e-books copied, number of pirated books purchased, number of (unauthorised) e-books downloaded, number of books photocopied and total number (adding up the previous four) of pirated books respectively. The results offer an interesting explanation which differ from the earlier explanation in the following ways:

Post-graduates students are less inclined towards photocopying of books as seen by the negative and significant coefficient on EDU\_PG in model 16 than the students in the benchmark category. This result can be justified on the ground that the course packs prepared at the level of graduation constitute of few books, i.e., there is less variation in terms of the number of books to be referred. To cite an example, 'mathematical methods for economics', a subject taught in under-graduation in Economics (Honours) course in University of Delhi refers to only one book which very much makes the case for photocopying the entire book. However, at the level of post-graduation, the course pack consists of many books for reference which does not make a case for photocopying any

entire book. Moreover, the graduate students are more likely to get influenced by third's behaviour which may imply more hoarding (copying) of books and less of studying.

Researchers are more into literacy piracy (models 13, 14 and 15) which is justifiable as they have to cite a number of books and read many scholarly articles in order to prepare their thesis. The large volume invites literary piracy just to cut down on cost and availability.

Students in the medical sciences stream are also into literary piracy as seen by the positive and significant coefficient on dummy variable 'FAC\_MS' in models 13, 14 and 15 except for the photocopying aspects of literary piracy (model 16). We justify this keeping in mind the volume, number and prices of medical books which are generally on the higher side. However, the dislike for photocopied materials is also justified as their subject matter involves a lot of diagrams, and photocopied black and white diagrams will not provide better visuals.

The students enrolled in the faculties of social sciences (models 13, 14, 15 and 16), science and technology (model 16), commerce (models 13, 14, 15 and 16) and law (models 13, 15 and 16) are less inclined towards literary piracy when compared to students from the benchmark category. This is because the faculty of arts, which is subsumed in the benchmark, offers many disciplines where the students need to read a lot of literary and linguistic books, novels, autobiographies and all of it cannot be purchased, thus this may promote relatively more literary piracy as compared to other streams.

The negative and significant coefficients on the variable NON\_REGULAR (models 13, 14, 15 and 16) support the view that regular students (subsumed in the benchmark variable) are more involved in literary piracy as the majority of the course materials of non-regular courses is regularly uploaded and updated on the official websites with the idea that the students do not have to rely on anything else, other than these course materials. In addition, there is known dependence on guidebooks like King's Champion; the intuitive result that they would be less reliant on pirated literary material was corroborated by the empirical results.

Again, males are more inclined towards unauthorised downloading of e-books as seen by the positive and significant coefficient on MALE (model 15) as compared to the benchmark respondents. This shows that males are more of risk takers as downloading involves risk (often, downloading from torrent sites comes at the cost of computers being plagued by internet viruses), while females play safe.

Students in the lower income categories are more inclined towards illegal copying of e-books (model 13) as compared to students from the higher income categories who prefer to copy less. We observe a non-linear relationship between income of the students and literary piracy (Figure 2) – literary piracy is more at the lower income level which then subsides as the income increases. This is visible from the positive and significant coefficient on INCOME and negative and significant coefficient on INCOME<sup>2</sup> in model 13.

The students with gadgets (as can be seen by positive and significant coefficient on GADGETS) have greater inclination towards literary piracy (models 13 and 15), emphasising a positive relationship between access to gadgets and piracy. Language has proven to be a barrier to copying and downloading e-books as can be seen by the negative and significant coefficient on LANG\_HINDI in models 13 and 15. This is because most of the material available on the internet is in English language, and their Google translations are definitely not up to the mark.

**Table 8** Literary piracy

	Dependent variables						
	Number of e-books copied Model (13)	Number of pirated books purchased Model (14)	Number of pirated e-books downloaded Model (15)	Number of books photocopied Model (16)	Total number of pirated books Model (17)	Number of books photocopied (17-2SLs)	
EDU_PG	-0.338 (0.3840)	-0.110 (0.3840)	0.707 (0.4575)	-0.973** (0.4666)	-2.2113** (0.9953)	0.4317 (0.7591)	
EDU RESEARCH	1.861*** (0.5720)	3.057*** (0.5229)	3.545*** (0.6350)	1.026 (0.6253)	9.6858*** (1.7431)	1.80937* (1.0951)	
NON-REGULAR	-1.307*** (0.3567)	-1.152*** (0.3515)	-0.915** (0.3890)	-1.473*** (0.432)	-4.6126*** (1.0424)	-1.1900* (0.4632)	
FAC SOC SC	-2.297*** (0.4330)	-1.362*** (0.3922)	-1.945*** (0.4383)	-1.747*** (0.4688)	-7.2370*** (1.1907)	-1.5870*** (0.4792)	
FAC MS	3.612*** (0.6389)	1.353* (0.7404)	4.573*** (0.8093)	-2.209** (0.8788)	7.7070*** (2.1801)	-1.7078* (0.9618)	
FAC S&T	-0.486 (0.4943)	-0.260 (0.5241)	-0.215 (0.6005)	-2.811*** (0.5277)	-3.2335** (1.4756)	-2.5246*** (0.5536)	
FAC COMM	-1.122*** (0.1517)	-0.978*** (0.2188)	-1.477*** (0.1881)	-0.922*** (0.2267)	-4.1875*** (0.5261)	-1.1262*** (0.2455)	
FAC LAW	-2.542*** (0.5187)	0.349 (0.5926)	-2.224*** (0.6832)	-2.110*** (0.6542)	-5.1027*** (1.4029)	-2.9757*** (0.7687)	
MALE	-0.076 (0.1673)	-0.257 (0.1779)	0.436** (0.1843)	-0.033 (0.2179)	-0.0363 (0.5113)	-0.0559 (0.2155)	
INCOME	0.0001*** (0.0000)	-0.00005* (0.0000)	0.00002 (0.0000)	0.00002 (0.0000)	0.0001 (0.00008)	0.00001 (0.00003)	
INCOME <sup>2</sup>	-1.05e <sup>-09</sup> *** (3.38e <sup>-10</sup> )	5.38e <sup>-10</sup> (3.52e <sup>-10</sup> )	-5.23e <sup>-10</sup> (4.02e <sup>-10</sup> )	-4.71e <sup>-10</sup> (4.08e <sup>-10</sup> )	-1.58e <sup>-09</sup> (1.18e <sup>-09</sup> )	-3.27e <sup>-10</sup> (4.23e <sup>-10</sup> )	
LANG HINDI	-0.732*** (0.1438)	0.190 (0.2437)	-0.597*** (0.1812)	0.306 (0.2468)	-0.8830 (0.5851)	0.3667 (0.2518)	
GADGETS	0.775** (0.2311)	1.000*** (0.3245)	0.830*** (0.2723)	-0.086 (0.2723)	2.7677*** (0.7641)	-0.2018 (0.2763)	
INTERCEPT	2.427*** (0.3989)	2.332*** (0.4065)	2.136*** (0.4521)	6.604*** (0.4991)	13.2040*** (1.1749)	6.4083*** (0.5026)	
N	1,310	1,318	1,311	1,312	1,265	1,312	
R <sup>2</sup>	0.3788	0.1427	0.2883	0.0828	0.3221	0.0738//0.6800	

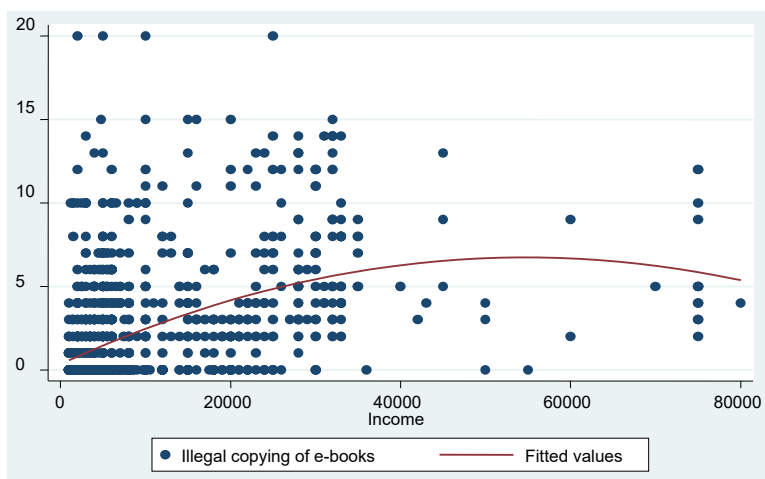
Notes: \*\*\* 1% significance, \*\* 5% significance, \* 10% significance. Standard errors are in parenthesis.



**Table 9** Total piracy (summary results)

	Dependent variables <sup>1</sup>		
	Cinematographic piracy	Music piracy	Literary piracy
EDU_PG	-0.7238 (1.6742)	-6.7305 (4.8003)	0.7909 (0.7162)
EDU_RESEARCH	-9.5514*** (2.0987)	-22.1095*** (5.2540)	6.8676*** (1.0629)
NON-REGULAR	-7.1274*** (1.7109)	-14.6088*** (3.8210)	-0.3359 (0.4920)
FAC_SOC_SC	-4.0832** (1.7224)	-0.0097 (4.9580)	-0.7018 (0.5724)
FAC_MS	-5.8480** (2.8197)	-4.9806 (7.1092)	4.2189*** (0.8427)
FAC_S&T	-4.7375** (1.9772)	0.7733 (6.3414)	0.7960 (0.8016)
FAC_COMM	-0.8177 (0.5931)	-1.2374 (1.4885)	-0.1706 (0.2299)
FAC_LAW	5.0621** (2.5378)	2.2912 (6.8561)	-1.3996 (0.8694)
MALE	2.4636*** (0.6370)	6.0817*** (1.9024)	0.7727*** (0.2268)
INCOME	0.0001* (0.0001)	-0.0004 (0.0003)	0.0002 (0.00004)
INCOME <sup>2</sup>	-1.84e <sup>-09</sup> (1.16e <sup>-09</sup> )	2.69e <sup>-09</sup> (3.42e <sup>-09</sup> )	-4.88e <sup>-11</sup> (6.68e <sup>-10</sup> )
LANG_HINDI	-0.7123 (0.4445)	-1.4560 (1.5855)	-0.2358 (0.2096)
GADGETS	5.7025*** (0.8739)	11.6715*** (3.0314)	2.8752*** (0.2924)
INTERCEPT	3.6307*** (0.8395)	3.8960 (2.5832)	0.5564* (0.3278)
N	-1.3541 (1.6339)	2.8765 (7.9004)	-1.7491*** (0.5798)
R <sup>2</sup>	6.9757*** (1.6085)	30.1719*** (4.4044)	-0.3212 (0.5364)
EDU_PG	1241	1251	1270
EDU_RESEARCH	0.2502	0.1054	0.4155
			0.3327

Notes: The dependent variables are the sum total of numbers in various forms of piracy (Unauthorised copying, purchasing pirated products, and unauthorised downloading) that is included in the study. We have additionally included photocopying of books for measuring total numbers in literary piracy.

**Figure 2** Relationship between income and literary piracy (see online version for colours)

We also have model 17 where we introduce the total number of pirated books as the dependent variable, which is the sum of previous four dependent variables of previous four models. We find that the students enrolled in research courses, medical sciences and students with gadgets are more inclined towards literary piracy. However, students enrolled in post-graduate courses, faculties of social sciences, sciences and technology, commerce and law, and students in non-regular courses are less inclined towards literary piracy. Income, language and gender share no significant relationship with literary piracy.

The last column of Table 8 corrects for endogeneity and shows the result of the regression of the most dominant form of literary piracy (i.e., number of books photocopied) in our study, on instrumented education where we use both the father's and mother's education as instruments for the students' level of education. The results are almost the same; therefore, we prefer not to give a detailed explanation again. The non-regular students and students in every faculty are less inclined towards this form of piracy as compared to the benchmark group. However, researchers are more inclined towards literary piracy. Gender, income, language and access to gadgets could not find any association with this form of piracy. Finally, all the results are summarised in Table 9.

## 6 Conclusions

The Copyright law of India provides protection on many aspects. Here our focus is on four specific domains of the law, i.e., cinematography, musical works and sound recording, software and literary works. This study brings out the factors explaining the prevalence of piracy in above domains. The purpose was achieved by conducting a survey among the students at the University of Delhi focussing on both the quantitative and behavioural aspects which can help explain piracy. We looked at three specific forms of piracy – unauthorised copying (duplication), purchasing pirated materials and unauthorised downloading. Apart from this, we also looked at photocopying of books as another form of piracy. Our results are quite intuitive and provide relevant insights into

the world of piracy. Moreover, it remained robust and hardly changed even with the use of instrumented variables.

For the students enrolled in postgraduate courses and researchers, we observed less piracy in cinematography, musical works and sound recording and literary works, except for software where we found more engagement of the researchers. Software (unauthorised downloading) piracy is more skill based and students' income has nothing to do with it.

Students in faculties of medical sciences, science and technology, social sciences and commerce are less inclined towards pirated cinematography and musical works and sound recording in comparison to the benchmark category, except the faculty of law. There is a strong liking for software and literary piracy (downloading and copying) among the medical sciences students. Further, we observed that the students in Faculty of Arts outweigh other streams, especially in terms of photocopying of books, which is explained on the basis of their greater requirement to study novels, autobiographies and various linguistics books.

Regular students outweigh students from the benchmark category on piracy count, except on software piracy. This is explained on the basis that even non-regular students go for diplomas or short-term job-oriented courses where the knowledge of software is a must, thereby promoting software piracy as most of them belong to the lower socioeconomic strata.

Language (Hindi) has proven to be a barrier to illegal copying and downloading aspects of literary piracy. Purchasing pirated products is the least favoured among all variants of piracy considered under this study. Males are more involved in piracy – they are more of the risk takers as their involvement in illegal copying and downloading is higher. We observed a non-linear relationship between income and cinematographic piracy. The importance of access to gadgets is clearly seen in almost all the forms of piracy.

Thus, this prior knowledge of who is outperforming (in terms of piracy) whom and what are the factors behind it can help the policy makers as they can go for target-based policies for tackling the menace of piracy. These estimates can help the policymakers to devise efficient methods for curbing movie piracy with well-targeted policies. The Indian government in the year 2019 introduced much harsher punishments for copyright violations in its recent amendment to the Copyright Act. Likewise, the government can also check for the imports of pirated DVDs, regulate torrent websites, and discourage video recordings of movies in cinema halls. Apart from these, the government should instil fear among the public against piracy by demonstrating and documenting the penalties associated with piracy. It should reach the common ears that the government is tough on piracy, and the pirates cannot escape from the clutches of the law.

However, this study is limited in the sense that it is based on the perspective of end users and does not really cater to the long list of people who are engaged right from the production of pirated products to procurement and distribution among general public. Further, the study cannot comment on piracy behaviour other than among the students' population.

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## Notes

- 1 We choose to focus upon these forms of piracy in order to keep our study manageable. In fact, however, there are some other forms of piracy as well, such as importing copies of copyright protected material into India, exhibiting/distributing in public by way of trade, but these are probably much less important in the overall scheme of things.
- 2 Optimism bias is the individual's belief that they are immune to a negative event.
- 3 The theory of planned behaviour is a theory that links one's beliefs and behaviour.
- 4 The theory of reasoned action explains the interlinkages between the behaviours and attitudes within human actions.

- 5 The theory of differential association in criminology, developed by Edwin Sutherland, shows that individuals learn the attitudes, values, techniques and motives for criminal behaviour through interaction with others.
- 6 Course packs are developed by professors of respective departments. It constitutes of all the reading materials which they think as essential for the syllabus of the course.
- 7 We look at these copyright violations in absolute numbers to arrive at different dependent variables on which we test equation 1, i.e., number of unauthorised downloads, unauthorised (physical) copies and number of pirated copies purchased.
- 8 Online piracy-constitutes of unauthorised downloading, and copying of copyright protected materials.
- 9 Offline piracy constitutes of purchasing pirated materials, and photocopying of books.
- 10 Bare acts are simple (guide) books which probably every law student refers to: they are concise and comprehensive books on every law aspect.
- 11 Threshold level of income is calculated as  $-B1/2B2$  where B1 is the coefficient on income and B2 is the coefficient on income square.