



## Streaming Media: Safeguarding Music Industry against Piracy?

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### Keywords

Music streaming  
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Logit model  
Impact  
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### Abstract.

Several studies were carried out to examine the influence of different factors such as music streaming, collective attitude, biases toward risks and beliefs about copyright law on music piracy. We study elements determining the role of music piracy and streaming in the behaviour of those individuals pirating music in Pakistan. As many as 1052 surveys online are collected. The logit model is used to analyse the collected data. The findings demonstrate that streaming services enhances the probability of piracy. Findings further validate that the non-availability of low-cost alternatives to piracy perceptions, the influence of social group, risk-related perception, beliefs of no harm to the industry and online activity are the main factors increasing the probability of pirating music. It is also found that student respondents are more prone to download music illegally than non-students ones. Similarly, the younger respondents are more pirating music than older ones. In the same way, the male respondents are more downloading music illegally than female ones.

## 1. Introduction

Media consumption in digital format is increasing rapidly around the world. With the increase in Internet access speeds, the number of devices capable of supporting digital media has given users access to the media content of their choice, whether it's information, entertainment or social activity at anytime and anywhere (see XDeloitte [61]). After this development of technology, streaming media especially music streaming also rapidly emerged worldwide and it gives online access to song tracks for a small fee (see Borja and Dieringer [9]). The worldwide revenues of streaming in 2018 were US\$8.9 billion which was almost half (47 %) of the total global recorded music market. After the addition of 79 million users of paid subscription accounts in 2018, the total number of users stood at

Table 1: Represents music streaming and piracy.

Music Streaming	Music Piracy
<ul style="list-style-type: none"> <li>• Almost free (Very low fee)</li> <li>• High quality</li> <li>• Access to a large dataset of songs</li> <li>• Link favourite songs to media site</li> <li>• Rapid access to songs</li> <li>• Low risk of computer viruses</li> <li>• No fines or jail time</li> </ul>	<ul style="list-style-type: none"> <li>• Free of charge</li> <li>• Low quality</li> <li>• Access to a large dataset of songs</li> <li>• Share favourite songs with friends (P2P)</li> <li>• Rapid access to songs</li> <li>• High risk of computer viruses</li> <li>• Fines and jail time</li> </ul>

Source: (Aguiar & Waldfogel, 2015; Borja & Dieringer, 2016; PAS, 2014; Thomes, 2013).

255 million worldwide. In the same year, the revenues of streaming did not only increase worldwide but also in Asia and Australia region. While the streaming sector has shown growth by 60.8 % in India – a landlocked country with Pakistan (see IFPI [28], IFPI [29] and IMI-IFPI [30]).

After growth in this sector, various questions arise “about the relationship between streaming and piracy”. As, streaming is perceived as a substitute product to piracy, but both have some similar elements (see Table 1). The rise in streaming services may help to reduce the piracy of music. On other hand, streaming could supplement piracy because it is used as means of exploring and listening to new songs which may lead to downloading music illegally. Streaming service might be costly for mobile users because it requires extensive data and this could be another reason for illegal downloading of music. Besides computer viruses’ risk, pirates are at risk of penalties such as 3 years imprisonment or fines or both (see PAS [47]). Whereas, streaming users are not exposed to the risks of computer infections and fines or jail. However, the younger peoples are not likely to be aware of these risks and the technical cost of illegal downloading of music. In addition, younger consumers are probably to follow the behaviour of social groups and they might continue such practices as long as they are members of such groups.

The main purpose of this study is to inspect the elements influencing users’ choice to pirate music. Another aim of this study is to find out “either streaming acts as a substitute or complement of piracy”.

The occupation (Students and Non-students) parameter is employed in our study and for this purpose, we randomly choose respondents i.e., students and non-students like professionals through an online questionnaire that was distributed via different media tools like social media. The logit model is used to analyse the collected data. The six hypotheses were examined as shown in Figure 1.

The findings of our study validate that students are pirating more music rather than non-students. The results further show that music streaming enhances the likelihood of committing piracy, supplying proof of “a complementary element between streaming and piracy”. It is discovered that the non-availability of low-cost alternatives to piracy, the influence of social groups, risk perceptions, online activity and beliefs of no harm to the music industry are the main elements increasing the probability of pirating the music.

Apart from this, the marginal impact of the occupation parameter is larger than all variables in our study ranging from 16.29% and 11.31%, suggesting that occupation enhances the likelihood of illicit downloading of music by 16.29% and 11.31%. Similarly, the music streaming in our study enhances the probability of pirating music by 3.16%, confirming that the streaming service enhances the likelihood of piracy. In the way, the marginal impact of all other parameters ranges from 1.45% and 8.95%, suggesting that the non-availability of low-cost alternatives to piracy perceptions, the influence of social groups, risk-related perceptions, beliefs of no harm to the industry and online activity are main factors increasing the probability of pirating music from 1.45% to 8.95%. The marginal impact did not change in spite of adding streaming variables and age to each parameter in Table 8 and Table 7. However, the marginal impact of all other parameters in our study is relatively smaller than previous studies, suggesting that the factors in our study are likely to increase piracy lesser than the past studies.

## 2. Theoretical Framework, Literature Review and Hypotheses

Music piracy is perceived as a big challenge for the recorded industry and economies of different countries in the world. India (76 %) is among the 5 top-rated countries for piracy (see IMI-IFPI [30]). In past, a large number of studies had been conducted on music, piracy and software piracy. However, few studies have been carried out on music piracy by associating it with a business model of streaming. Borja et al.[10] and Borja and Dieringer [9] conducted the study separately on music piracy by associating with the business model of streaming and both were carried out in America where the students were selected for both studies. However, in the case of Pakistan, no specific study was conducted on music piracy linking with a business model of streaming so far. For this purpose, two studies by Borja et al.[10] and Borja and Dieringer [9] have been focused as the basis and the frame has been developed accordingly. Keeping in view these studies, we select some factors, i.e. music streaming, price, peer pressure, low perception of risks, views regarding the music industry and artists, online activity and demographic factors, to examine whether they are more likely to increase music piracy or not. The main reason beyond choosing these elements was that they were already tested in different countries excluding Pakistan. In addition to this, they are interconnected with each other to enhance music piracy.

Alike other parts of the world, streaming in Pakistan has shown growth after technology development. As it is perceived as a substitute product to piracy, both have almost similar elements (see Aguiar and Waldfogel [1], Borja and Dieringer [9], PAS [47] and Thomes [58]). So, the rise in streaming services might have helped to reduce the piracy of music. On the contrary, the previous studies validated that streaming supplemented piracy because it is used as means of exploring and listening to new songs which may lead to downloading music illegally (see Borja et al.[10] and Borja and Dieringer [9]). Furthermore, the price is also another element to increase music piracy as streaming service might be costly for mobile users because it requires extensive data and this could be another reason for illegitimate downloading of music (see Borja and Dieringer [9]). Moreover, streaming users are not at risk of computer infections and fines or imprisonment and this also helps to enhance music piracy in the country (see Borja and

Dieringer [9], Shanahan and Hyman [53] and Williams [60]). Likewise, the streaming users are more prone to follow the behavior of social group and they might continue such practices as long as they are a member of such groups (see Akers [3], Morris and Higgins [42], Rochelandet and Guel [52]). This also enhances music piracy. There are widespread views among people that piracy does not harm artists or the music industry. Besides, a common opinion is that the music industry and artists, for several years, have been taking advantage from consumers by compelling them to buy a complete CD containing numerous songs of low-quality, only to have access to the single track (see Bowie [11], Coyle et al. [16], Hinduja [25], Kwong et al. [32] and Levin et al. [34]). Such beliefs regarding the music industry's affectees can justify illegal activity's persistence and ultimately enhance music piracy. Apart from this, another factor "prevalence of past behavior" enhances capabilities because it is the forecaster of intents, desires and behavior of people (see Perugini and Bagozzi [49]). So, the information regarding navigation, familiarity and frequency of usage and online shopping may enhance music piracy (see Sims et al. [54], Tan [57]). Moreover, shifting from legitimate to illegitimate digital downloading and sharing should not indicate the important restrictions in mind of users of computer-savvy (see Borja and Dieringer [9]). The younger people especially males are not likely to be aware of these risks and technical costs of illegal downloading of music and even they are probable to follow the behavior of social groups and they might continue such practices as long as they are a member of such groups (see Borja and Dieringer [9] and Rochelandet and Guel [52]). So, demographics factors have also increased music piracy (see Bhattacharjee et al. [8], Borja et al. [10], Coyle et al. [16], Gopal and Sanders [21], Hoon et al. [26], Madden [36], Rochelandet and Guel [52], Shanahan and Hyman [53], Sims et al. [54], Sinha and Mandel [55] and Tan [57]).

However, it is very hard to evaluate the exact losses that occurred to global economies due to this serious problem i.e piracy. Numerous studies have been carried out by economists, social psychologists and criminologists to predict digital piracy within young people (see Borja et al. [10], d'Astous et al. [18], Gopal et al. [20] and Morris and Higgins [42]).

Keeping in view past studies, this study is based on seven hypotheses as given below.

### **2.1. Demographics (Age, Gender and Income)**

The demographic factors can explicate music piracy.

For example, the individuals, who have huge "disposable income, are more inclined to purchase music rather than pirating" (see Coyle et al. [16], Gopal and Sanders [21], Hoon et al. [26], Rochelandet and Guel [52], Sinha and Mandel [55]). According to Madden [36], Bhattacharjee et al. [8] and Rochelandet and Guel [52], females are not more prone to engage in piracy than male ones and it is alike outcomes from software industry (see Sims et al. [54] and Tan [57]). Though, Shanahan and Hyman [53] and Borja et al.[10] corroborated that there is no strong support for probability of piracy and gender.

The first hypothesis is developed following discussion.

### **Hypothesis 1.**

- 1.1. Females would have higher or lower engagement in music piracy than males.
- 1.2. Lower-income respondents would have higher or lower engagement in music piracy than higher-income respondents.
- 1.3. Younger respondents would have higher or lower engagement in music piracy than older respondents.

### **2.2. Peer-pressure**

A framework for understanding piracy behaviour is given by theories like social learning (Akers [3] and Akers [4]) and planned behaviour (Ajzen [2]). A sequential process was established by Ajzen [2], while the purpose of engaging in an activity, either it is legitimate or illegitimate, is connected with three variables. Initially, attitude towards individuals behaviour or their views about rewards and risks have an effect on an intention for executing the action. Secondly, social norms like the beliefs of peers regarding risks and rewards connected to the activity, have an effect on the individuals' behaviour. In the last, behavioural control like a view relating to controlling phases of action, influences act and intention. Numerous social scientists have studied planned behaviour theory for investigating music and software piracy (see Al-Rafee and Cronan [5], d'Astous et al. [18], Levin et al. [35], Peace et al. [48] and Shanahan and Hyman [53]). People are inclined to follow illegal action of piracy, if they socialize with such groups that consider risk lesser than rewards related to criminal activity and are vigorously engaged in illegitimate behaviour. Such findings are supplemented by social learning theory. It was established by Morris and Higgins [42] that variables of social learning, determined by Akers [3], were piracy's strong predictors. Additionally, Huang [27] established that "act of piracy is perceived as a publicly recognized and low ethical activity which is appealing to follow". Rochelandet and Guel [52] and Manski [38] confirmed the hypotheses of peer-pressure by presenting that people imitate their social groups, when an activity's outcomes are hard to determine. Moreover, Ingram and Hinduja [31] and Chiou et al. [14] corroborated from the set of music piracy's descriptive variables that social groups supply a significant relationship with piracy. Besides, Borja et al. [10] validated that attitudes of social groups towards piracy enhance the probability of engaging in piracy.

LaRose and Kim [33] supported that statements like "everyone else is downloading music, thus, it's OK for me to do it" and "I know lots of people who download more than I do" are strong predictors of piracy.

The second hypothesis is developed with the support of the above literature.

**Hypothesis 2.** The pressure of peers enhances the probability of engaging in music piracy.

### **2.3. Low perception of risks and penalties**

Under ambiguity, the optimal choice's economic theory forecast that sensible people exploit "expected utility". "The expected utility, in the case of a pirate, is an outcome of two opposed results": bigger utility connected with the music consumption at free of

charge, and the drop of wealth and utility if held for executing offence – imprisonment and fines and crime’s record which has an effect future opportunities like job or income. However, the net outcome of music piracy is beliefs of the probability of being held or convicted (see Borja and Dieringer [9]).

Mostly, all users are well-known that piracy is illicit action and has prices connected with penalties. The younger population especially undergraduate students perceive pirating as dissimilar activity from stealing and think that it works under disparate norms (see Cordell et al. [15], Shanahan and Hyman [53] and Williams [60]). Young generations are “growing up with the internet and easy access to music and downloading of videos” and they may have an unclear awareness of penalties related to piracy.

Ingram and Hinduja [31] validated that 90% of participants perceived illegal downloading of music files as justifiable behaviour. According to Borja et al. [10], the students of the college recognized limited risks related to pirating music, like the low probability of being caught or infected with their computer with viruses. In contrast, they see return obliviously from such activities, like getting the product at no cost and fame within social groups. Pryor et al. [50] corroborated that the majority of people do not accept as reality that they would be arrested or they would be penalized strictly for such illicit activity. Other studies supported similar outcomes about the views of punishments and risks (see Coyle et al. [16], Hoon et al. [26], McCorkle et al. [40], Nandedkar and Midha [43], Shanahan and Hyman [53]).

With the support of the above literature, the third hypothesis is developed.

**Hypothesis 3.** Perception of risks and penalties linked to music piracy decreases the probability of being engaged in music piracy.

#### 2.4. Views about music industry and artists

Dissimilar from street offenders, the damage has caused to stakeholders of the music industry is not observed by pirates – involved in the online illegitimate activity (see Hinduja [25] and Nettler [46]). Ingram and Hinduja [31] and Hoon et al. [26] confirmed regarding the widespread views within students of the college that that piracy does not harm artists. On the opposite, a common opinion is that the music industry and artists, for several years, have been taking advantage of consumers by compelling them to buy a complete CD containing numerous songs of low-quality, only to have access to the single track (see Bowie [11], Coyle et al. [16], Hinduja [25], Kwong et al. [32] and Levin et al. [34]). Such beliefs regarding the music industry’s affectees can justify illegal activity’s persistence. Maruna and Copes [39], Ingram and Hinduja [31], and Morris and Higgins [42] captured such attitude while assessing “denial of responsibility”, “denial of injury to others”, and denial of victims”. These authors recommended, by means of principal-component factor analysis, an optimistic relationship between these perceptions and the intentions to pirate music. Furthermore, Nasheri and O’Hearn [44] and Coyle et al. [16] gave proof of insignificance towards victims of piracy because of the “nature of human to machine interaction”.

With the support of such information, the following hypothesis is constructed.

**Hypothesis 4.** The perceptions of consumers regarding the music industry or artists negatively affect the probability of being engaging in music piracy.

### 2.5. Online activity

The third element of intention, exhibited in section 2.2, of engaging in a specific activity is behavioural control, which is the belief in controlling phases or procedures in carrying out the action (see Ajzen [2]). Views of subjects about their capabilities, in the case of music piracy, of using technology and tools for pirating music have an effect on illegitimate behaviour.

Perugini and Bagozzi [49] gave an argument that the prevalence of past behaviour increases capabilities, and therefore, is the forecaster of intents, desires and behaviour of people. In the case of piracy, the information regarding navigation, familiarity and frequency of usage and online shopping may enhance music piracy. Shifting from “legitimate to illegitimate digital downloading and sharing should not indicate the important restrictions in mind of users of computer-savvy”. Sims et al. [54] and Tan [57] established that pirates of software are not more unlikely to have more skills of computer system and are more well-known with different software products.

Three hypotheses were developed and tested, by d’Astous et al. [18], on the correlation within the previous experience of exchanging music on the internet, and the intents, attitude and probability of being engaged in music piracy. In these cases, the previous experience and behaviour emerged as significantly and statistically predictors of intentions and attitudes for engaging in music piracy. An “internet skills” index, developed by Rochelandet and Guel [52] and calculated by total hours consumed every day over the internet, established that it affected piracy. Furthermore, comparable methods to determine expertise and familiarity of online performance were used by Hinduja [25] and Higgins and Makin [24].

Hence, a hypothesis is developed.

**Hypothesis 5.** Online activities enhance the probability of being engaged in music piracy.

### 2.6. Music Streaming: Complements and substitutes

Studies on music piracy concentrated on users’ views of similar products and causing displacement within products. The majority of researches confirmed that piracy harms sales of CDs; and consumers perceive piracy as an alternative to CDs and paid online music (see Aguiar and Waldfogel [1], Andersen and Frenz [6], Rob and Waldfogel [51] and Waldfogel [59]). However, sufficient research is not available concentrating on streaming hurting piracy. Besides, piracy and music streaming can be considered as comparable products (see Fig.1); therefore, streamers could alter their behaviour towards less piracy and more streaming. Although, streaming users could recognize complementary traits, by which streaming permits the new music’s discovery before pirating it. The sampling effect could certainly enhance piracy in streaming’s presence. Bhattacharjee et al. [8] finished surveys of over 200 college students and gave proof of a connection between music piracy and the prices of CDs. Gopal et al. [20] confirmed from the sample of 133 students of undergraduate that accessibility of low-cost alternatives to CDs of music,

<b>Factors</b> →	Consumer demographics	H1: Age, gender, and income affect the likelihood of engaging in music piracy.	<b>Hypotheses</b> ←
	Peer-pressure	H2: Peer pressure increases the likelihood of engaging in music piracy.	
	Perceptions about risks and penalties	H3: Low perception of the risks and penalties associated with music piracy increases the likelihood of engaging in music piracy.	
	Views about the industry and artists	H4: Individual's views about the music industry or the artists affect the likelihood of engaging in music piracy.	
	Online experience	H5: Online activities increase the likelihood of engaging in music piracy.	
	Substitutes or complements	H6: Music streaming affects the likelihood of engaging in music piracy.	

Source: Adapted from Borja et al. (2015), and Borja and Dieringer (2016)

Figure 1.

like downloads of MP3 music, decreases piracy of music. Consequently, both types of research confirmed the displacement hypothesis.

On the contrary, Borja et al. [10] established that music streaming enhances the probability of piracy of music. Aguiar and Waldfogel [1] found that “artists that are streaming more on Spotify this week tend also to be pirated more this week, after accounting for the various fixed effects”. In this case, streaming’s business model lets access without difficulty to the latest releases, which subsequently complements the illegitimate downloading of music by the pirate. In spite of a growing number of streaming users, this may give details on the persistence of illicit digital music sharing.

The following hypothesis was is developed.

**Hypothesis 6.** Music streaming affects positively the probability of being engaged in music piracy’s activity.

Furthermore, for examining the displacement effect versus sampling effect, it was studied whether prices show the related element for an explanation of music piracy.

Harrington [23], Gopal and Sanders [19] and Cheng et al. [12] confirmed that saving money and prices are common reasons for the behaviour of piracy normally. Though, after the arrival of music streaming and its comparative low-priced track, we expect that no longer, the cost matters for representing the related element for an explanation of piracy.

Although, music streaming’s growth and development has been contemporary and therefore, it could give new descriptive factors for illegitimate downloading of music which is not so far completely understood.



### 3. Methodology

#### 3.1. Research modeling

A survey instrument and models - based on the six hypotheses, were used (see Figure 1) to collect data from Pakistan. However, our study has followed previous research conducted by Borja and Dieringer [9] and its survey instrument has also been adapted to collect the data.

#### 3.2. Data source

The details about the nature of the study were shown in the upper part of the questionnaire (see Author [7]). In addition, the respondents were also informed that the information given by them would not be shared with anyone. The questionnaire is comprised of 23 questions, containing the part of demographic variables like age, occupation, qualification and income. Of the total, eight questions were associated with online shopping, music streaming and downloading of music and movies and also their frequencies in the last 40 days. In the end, four questions sought data regarding illegitimate downloading music and followed by the 10 explanatory arguments to be selected as personal reasons for such behaviour. These statements were transformed into dichotomous variables, whereas if the respondents mark the statement, its value would be 1 and 0 if the statement was left unmarked. As many as 2200 questionnaires were randomly selected by distributing them among respondents in Pakistan via different tools i.e. online media especially emails and social media networks i.e. WhatsApp groups, WeChat groups and Messenger. Apart from this, we used personal contacts like friends to distribute the questionnaires to get a maximum number of questionnaires filled. The 775 respondents did not respond, while 373 questionnaires were dropped due to incomplete information and ambiguous answers. From 2200 questionnaires, we collected data of 1052 questionnaires.

We employed a dichotomy scale because we used primary data and the major part of the data was in the binary form where there were two options given to the respondent to reply, that's why these statements were transformed into dichotomous variables, whereas if the respondents mark the statement, its value would be 1 and 0 if the statement was left unmarked.

### 3.3. Data analysis

#### 3.3.1. Logit model

A logit model was used to find out the music streaming's impact on the probability of piracy behaviour. Furthermore, we assessed the views of users about rewards and risks linked to piracy, the impact of peer-pressure and perceptions regarding the music industry as factors having an effect on the probability of pirating music. We describe the model in Equation 1.

$$P[Z_i = 1 | X] = F(\beta_0 + \beta_1 MS_i + \beta_2 D_i + \beta_3 H_{j,i} + \varepsilon_i) \quad (1.1)$$

The  $Z$  represents the dependent variable which is the dichotomy index and it takes the value of one, if respondent  $i$  stated illegitimate music downloading and zero otherwise.

Whereas, the  $P$  is likelihood or probability which  $Z_i$  is equal to one. In an equation,  $X$  is explanatory factors, comprising  $MS_i$ , that takes the value of one, if any service of Music Streaming was used in the previous 40 days and zero otherwise.  $D$  represents a vector of control variables like age, gender, income and profession. While,  $H_j$ ,  $i$  is factor  $j$  from the 10 explanatory statements' list for piracy. For instance, if participant  $i$  marked statement H6: "I download music without paying for it because it was so much expensive that I could not buy", then H6,  $i$  takes the value of 1 and zero otherwise (see Table 2).

**3.3.2.** STATA 2019 was used to analyse data. Table 2 presents the definition of each variable presented in the article (see STATA [56]).

## 4. Results and Discussion

Of total observation, 85 % of respondents reported themselves to have downloaded music illegitimately in the previous 40 days. The 69% of the total 1052 respondents are males and 31 % are females. The average age of the sample is 28.64 years old.

### 4.1. Descriptive statistics by Profession (Student and Non-student)

Table 3 illustrates information about each sub-sample based on student and non-student categories. The difference between the categories by profession of the respondents is significant. Of a total of 1052, the 649 participants are students, while 403 are non-students. Of 649 student participants, 76% are males and 24% are females. Similarly, of 403 non-student participants, 41% are females and 59% are males. Besides, there is a difference in age and education between the two categories. The average age of non-student respondents is 35.53 years old and 24.36 years old is the average age of student participants. The majority of the total student respondents are Bachelors (33%) and (52%) Masters. In the same way, the majority of total non-student participants are bachelors (25%) and masters (67%). There is no significant difference in income between these two categories. However, this study is focusing on student and non-student populations as already frequent piracy was observed among student respondents in the past studies (see Cheng et al. [12], Bhattacharjee et al. [8], Rob and Waldfogel [51], Ingram and Hinduja [31], Coyle et al. [16], Morris and Higgins [42], and Shanahan and Hyman [53]).

### 4.2. Descriptive statistics by groups

Table 4 demonstrates "the statistical differences between the two groups i.e. those participants who downloaded music illegitimately (Group 1), and those respondents who did not (Group 0)". The mean age of group 0 is 34.75 years old and 27.59 years old is the mean age of group 1, while the difference in age between these groups is statistically significant (SD=8.12, p-value = 0.0000). Statistically, a difference was found in age and gender but not in income (p-value= 0.7094) between two groups. Older participants (34.75 years old) did not pirate music as much as younger respondents did (27.59 years

Table 2: Variables and descriptions.

Variables	Hypotheses	Descriptions / survey question
Dependent variable: Music Piracy		= 1 if the respondent engaged in illegal downloading of music in past 40 days; = 0 otherwise
Music Streaming (MS)	H6: Music streaming affects the likelihood of engaging in music piracy	= 1 if yes. Did you use any music streaming service to listen music? (Q13). How many times in past 40 days (Q15)
Price-1 (Q23A)		= 1 if yes. I downloaded music without paying because It was so much expensive that I could not buy; and 0 otherwise. (Q23A)
Price-2 (Q23B)		= 1 if yes. I could not be able to buy all the music that I wanted to download.(Q23B)
Peer-pressure-1 (Q23E)	H2: Peer pressure increases the likelihood of engaging in music piracy	= 1 if yes. My friend and I did not believe that doing so was wrong. (Q23E)
Peer-pressure-2 (Q23F)		= 1 if yes. We did this all the time.(Q23F)
Risk-1 (Q23H)	H3: Low perception of the risks and penalties associated with music piracy increases the likelihood of engaging in music piracy.	= 1 if yes. I am sure that it is not a big threat to get caught. (Q23H)
Risk-2 (Q23I)		= 1 if yes, I am sure that if I get caught, the consequences would not be so severe. (Q23I)
Artist Concerns (Q23C)	H4:Individual's views about the music industry or the artists after the likelihood of engaging in music piracy	= 1 if yes. The artists are so prosperous and successful that they will not get hurt. (Q23C)
Industry Concerns (Q23D)		= 1 if yes. The music industry is quite profitable that it will not be able to harm the industry. (Q23D)
Online Activity-1 (Q23G)	H5: Online activities increase the likelihood of engaging in music piracy	= 1 if yes. It could be done easily and rapidly (Illegal downloading of music). (Q23G)
Online Activity-2		= 1 if yes. Did you download a movie from the internet? (Q10). How many times in past 40 days? (Q11).
How many times in past 40 days? (Q11).		0 = not in last 40 days; 1 = 1 – 7 times ; 2 = 8 – 13 times; 3 = More than 13
Control Variables: Age, gender, occupation and income.	H1: Age, gender, occupation and income affect the likelihood of engaging in music piracy.	Age of respondents (Q1); Gender of respondents (Q2); Occupation of Respondent (Q4); Income of Respondent or their family (Q5)
Age of respondents (in years) (Q1)		Age in years
Gender of respondents (in years) (Q2)		= 0 if male; =1 if female (Q2)
Occupation of Respondent (Q 4)		= 0 if student; = 1 if non-student (Q4)
Income of Respondent or his or her family (Q5)		Income in Pakistan Rupees (Q5)

old). The female respondents illegally downloaded less music than male respondents (p-value = 0.0000). Similarly, student participants illegally downloaded more music

Table 3: Descriptive statistics by Profession.

	Student	Non-student
Total Observation (1052)	649	403
Age (Mean)	24.36	35.53
Income	762435	791687
Male/Female participants	76%/24%	59%/41%
Matric/FA/Bachelor	0%/4%/33%	1%/2%/25%
Master/PhD	52%/11%	67%/5%

Table 4: Descriptive statistics by groups.

Variable	Download Illegally G-1	Not download Illegally G-0	SD (p-value)
Observation (1052)	897	155	
Age (mean)	27.59	34.75	8.12 (0.0000)
Gendor (0=male, 1=female)	0.25	0.65	0.46 (0.0000)
Occupation (0=student, 1 Non-Student)	0.29	0.92	0.49 (0.0000)
Income	7.71	7.92	6.62 (0.7094)
Online Shoping (1=Yes, 0=No)	0.42	0.09	0.48 (0.0000)
Frequency Online Shoping	0.41	0.05	0.48 (0.0000)
Online Movie Downloading (1=Yes, 0=No)	0.74	0.17	0.48 (0.0000)
Freq Movie Downloading	0.72	0.15	0.48 (0.0000)
Music Streaming (1=Yes, 0=No)	0.86	0.9	0.34 (0.1986)
Freq of Music Streaming	0.86	0.71	0.37 (0.0000)

\*Values in columns 2 and 3 are means of sample. The last column displays the standard error of the difference between two samples. It also displays p-values from an equal-mean t-test between group 1 and group 0. Detail on the variable are presented in (Table 2). The standard deviation (SD) statistics of our samples for age and income is surprisingly high. Our sample age ranges across 18 to 58 years and same variations find in their income level. This is main reason of their high SD score. In addition, we scaled income by 100,000.

than non-student participants (p-value = 0.0000). The higher-income and lower-income respondents are equally prone to pirate music (p-value= 0.7094).

No difference was found in “the usage of music streaming services between these two groups 1 and 0 (p-value = 0.1986)” but there is a significant difference in frequency of usage between these two groups (p-value = 0.0000). Group 1 (students respondents) illustrates more frequency in usage of music streaming than group 0 (non-student respondents) (group 1 = 0.86 and group 0 = 0.71; p-value = 0.0000). Group 1 – students are more inclined to illegally download more movies than group 0 – non-students (p-value = 0.0000). The student respondents are more likely to involve in online shopping than non-students (p-value = 0.0000). The standard deviation (SD) statistics of our samples for age and income are surprisingly high. Our sample age ranges across 18 to 58 years and the same variations are found in the income level. This is the main reason for their high SD score. Other outcomes are significantly reliable. In addition, we scaled income by 100,000.

### 4.3. Outcomes of Models

The logit models' results show the likelihood of piracy behaviour. The marginal effects or predicated probabilities are post-estimated that respondents pirated music to facilitate results' interpretation. The main results of the tables are delivered from equation No 01. Each model has two columns. The first column is logit that gives standard tests and parameter values corroborating the model; while the second column is a prob that provides "marginal effect at mean or likelihood of committing music piracy".

The negative parameter of gender in all models shows that male respondents are more inclined to download music illegitimately. The parameter of gender is statistically significant in all models of this study. In the same way, the parameter of occupation in all regressions is negative, indicating that student respondents are more prone to download music illegally than non-student ones. Parameter values of occupation are positive and significant. In all regressions, the negative parameter of age supplies proof that younger respondents are more likely to download music illegitimately than older ones. The age parameter is statistically significant and its marginal impact is comparatively small, which ranges from -0.75 (Model 3: Table 8) and to -0.88 % (Model 6 in Table 8).

In Model 1 of Table 5, the MS parameter is positive and statistically significant ( $p$ -value  $< 0.007$ ), supplying strong evidence supporting the sampling effect. Moreover, music streamers are inclined to commit piracy by 3.16 %. It gives evidence that music streaming is used to get easy access to hits of the day and new artists. The values of parameters linked to music streaming are positive and statistically significant in all models of this study except two- one in Model 2 in Table 7 and one in Model 1 of Table 8 respectively.

The price of alternative products is an important factor describing attitude to piracy. It is believed that low-cost substitutes to piracy are available. Model 2 in Table 5 and Model 6 in Table 6 provides the parameter of one predictor – Price. Price –1 is associated with the statement "I did it because it was so much expensive that I could not buy otherwise" and Price – 2 is linked to the statement "I did it because I could not be able to buy all the music that I wanted to download". Both statements of Price 1 and 2 enhance the probability of downloading music illicitly by 3.36 % and 5.38 % respectively. Participants consider that "other alternatives to listening to music such as streaming, purchasing single tracks online or physical CDs, are still greatly more expensive than piracy". This is the initial proof that respondents don't perceive streaming as a low-priced alternative to piracy. However, absolute income is irrelevant statistically. Therefore, relative income rather than absolute income is a predictor of piracy behaviour.

The parameters of another factor peer-pressure, evaluating the impact of social group on an individual's behaviour, are positive and statistically relevant (Model 3 in Table 5:  $p$ -value  $< 0000$  and Model 7 of Table 6:  $p$ -value  $< 0000$ ). The beliefs that "My friend and I did not believe that doing so was wrong" enhances the probability of piracy by 5.93 %, while the beliefs that "We did this all the time" enhance the likelihood of piracy by 6.47 %.

Values of a parameter in Model 4 of Table 5 and Model 8 of Table 6 supplies one factor – Risk. Risk-1 is linked to “I am sure that it is not a big threat to get caught”, while Risk-2 is associated with “I am sure that if get caught, the consequences would not be so severe”. Both statements regarding “the perceptions of low or no risk” enhance the probability of piracy by 4.24 % and 1.73 %. However, the Risk-2 parameter is positive but not statistically significant, providing poor evidence that there is a relationship between music piracy and perception of low or no risk.

Model 5 of Table 5 shows that the parameter of “Online activity -1” is positive and statistically significant ( $p$ -value  $< 0.0000$ ) and it enhances the likelihood of illegally downloading music by 4.38 %. This established that the respondents “who stream and pirate are computer savvy”. It is also upheld by Model 9 of Table 6 in which factor “Online Activity-2” denotes “the frequency of downloading movies in the last 40 days”. The parameter of this indicator enhances the probability of piracy by 8.40%.

Finally, participants who believe that “piracy does not harm the music industry” are more inclined to download music illegally by 4.85 % (Model 10 of Table 6).

In nutshell, streaming users are more inclined to pirate music. Perceptions of social groups about piracy encourage illegal activity among members. Besides, “beliefs of low or no risks linked to piracy” enhance the probability of music piracy. Similarly, views “that there is no harm to the music industry” enhance the likelihood of piracy. Participants believe that “alternative options to listening to music” are very costly, so they cannot stay away from pirating music. It shows that MS is yet not considered as a low-priced alternative to piracy.

In Table 7, the parameter of music streaming (MS) was included in all models. The purpose of including MS is to validate that MS is yet related to explaining piracy. The most essential thing here is to validate that MS does not protect the industry against the impact of peer-pressure, prices of alternative products, views regarding risks linked to piracy and industry concerns. For example, models in Table 7 exhibit that adding MS parameters to the logit model in all regressions did not change outcomes. For example, the Price parameter enhances the likelihood of committing piracy by 2.86 % (Model 1 of Table 7) as compared to 3.36 % without MS (Model 2 of Table 5). Similarly, the influence of social groups enhances the probability of piracy by 5.56 % (Model 2 of Table 7) as compared to 5.93 % without MS parameter (Model 3 in Table 5). Whereas, minimal concerns about risk enhance the probability of music piracy by 3.75 % (Model 3 in Table 7) as compared to 4.24 % without MS (Model 4 of Table 5). In the same way, a statement about computer skills “It could be done easily and rapidly” can enhance the likelihood of piracy by 3.95 % (Model 5: Table 7) as compared to 4.38 % (Model 5: Table 5). Low concerns about the music industry enhance the likelihood of music piracy by 4.39 % (Model 4 of Table 7) as compared to 4.85 % without streaming parameter (Model 10 of Table 6).

However, the parameter of MS is positive in Model 2 of Table 7 but not statistically significant which provides poor evidence that music streamers, influenced by social groups, are more likely to commit piracy. While, parameters of price, peer-pressure, risk, industry concerns and online activity in Table 7 are positive and statistically relevant.

Table 8 provides models which include age parameter in all regressions. The negative parameter of age in all models supplies proof that younger respondents are more inclined

Table 5: The probability of illegal downloading of music with Occupation Part -1 (Five Models).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Logit	Prob	Logit	Prob	Logit	Logit	Logit	Prob	Logit	Prob
H1-Gender	-1.651*(0.2152)	-8.01%	-1.637*(0.2138)	-7.96%	-1.628*(0.2193)	-7.55 %	-1.607*(0.2143)	-7.70%	-1.808*(0.2265)	-8.11%
H1-Occupation	-3.242*(0.3157)	-15.73%	-3.217*(0.3154)	-15.64%	-3.187*(0.3169)	-14.79%	-3.276*(0.3163)	-15.70%	-3.376*(0.3207)	-15.14%
H6-MS	0.651*(0.2419)	3.16%								
H6-Price 1			0.691*(0.2441)	3.36%						
H2-Peer-prssure-1					1.278*(0.2215)	5.93%				
H3-Risk-1							0.884*(0.2146)	4.24%		
H5-Online Activity-1									0.977*(0.2277)	4.38%
Pseudo R2	0.3431		0.3446		0.3753		0.3547		0.3573	
Wald Test	301.83(0.0000)		303.11(0.0000)		330.13(0.0000)		311.98(0.0000)		314.32(0.0000)	
Goodness-of-fit test	25.23(0.0000)		15.32(0.0041)		15.96(0.0069)		28.46(0.0000)		27.22(0.0001)	
Correctly Classified	88.31%		88.31%		89.64%		87.17%		88.02%	

\*The dependent variable is 1 if participants illegally downloaded music. Hi=hypothesis i (see Figure 1). Prob is the marginal effect (ME) calculated at the mean. \*, \*\*, and \*\*\* indicate statistical significance at 1%, 5%, and 10%, respectively. Values in parenthesis are standard errors. The Wald-Test verifies that all estimated coefficients are statistically significant predictors of the dependent variable (p-value< 0.05). The goodness-of-fitness test takes the form of a  $\chi^2$  statistics in which p-values higher than 0.05 indicate that the Logit model fits the data reasonably well. Correctly classified is the overall rate of prediction of the model.

Table 6: The probability of illegal downloading of music with Occupation Part-11 (Five Models).

	Model 6		Model 7		Model 8		Model 9		Model 10	
	Logit	Prob	Logit	Prob	Logit	Logit	Logit	Prob	Logit	Prob
H1-Gender	-1.717* (0.2180)	-7.82%	-1.773* (0.2285)	-7.31%	-1.560* (0.2096)	-7.75 %	-1.231* (0.2306)	-4.67%	-1.604* (0.2123)	-7.78%
H1-Occupation	-3.192* (0.3168)	-14.53%	-3.279* (0.3230)	-13.52%	-3.280* (0.3148)	-16.29%	-2.988* (0.3223)	-11.31%	-3.259* (0.3152)	-15.80%
H6-Price-2	1.182* (0.2934)	5.38%								
H2-Peer-prssure-2			1.569* (0.2297)	6.47%						
H3-Risk-2					0.349 (0.2130)	1.73%				
H5-Online Activity-2							2.218* (0.2571)	8.40%		
H4-Industry Concerns									1.00* (0.3229)	4.85%
Pseudo R2	0.3559		0.3920		0.3381		0.4381		0.3474	
Wald Test	313.09 (0.0000)		344.83 (0.0000)		297.39 (0.0000)		385.37 (0.0000)		305.55 (0.0000)	
Goodness-of-fit test	23.84 (0.0001)		25.88 (0.0000)		30.93 (0.0000)		28.46 (0.0000)		16.99 (0.0019)	
Correctly Classified	88.59%		89.16%		88.31%		87.17%		88.50%	

\*The dependent variable is 1 if participants illegally downloaded music. Hi=hypothesis i (see Figure 1). Prob is the marginal effect (ME) calculated at the mean. \*, \*\*, and \*\*\* indicate statistical significance at 1%, 5%, and 10%, respectively. Values in parenthesis are standard errors. The Wald-Test verifies that all estimated coefficients are statistically significant predictors of the dependent variable (p-value< 0.05). The goodness-of-fitness test takes the form of a  $\chi^2$  statistics in which p-values higher than 0.05 indicate that the Logit model fits the data reasonably well. Correctly classified is the overall rate of prediction of the model.

to pirate music than older ones. The age parameter is statistically significant and its marginal impact is comparatively small, which ranges from -0.75% (Model 3 in Table 8) and to -0.88% (Model 6 of Table 8).

Table 7. The probability of illegal downloading of music with MS (Five Models).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Logit	Prob	Logit	Prob	Logit	Prob	Logit	Prob	Logit	Prob
H1-Gender	-1.703* (0.2181)	-8%	-1.685* (0.2247)	-7.73%	-1.670* (0.2202)	-7.82 %	-1.678* (0.2171)	-7.84%	-1.850* (0.2300)	-8.25%
H1-Occupation	-3.189* (0.3169)	-14.99%	-3.148* (0.3176)	-14.43%	-3.241* (0.3172)	-15.18%	-3.221* (0.3170)	-15.04%	-3.323* (0.3214)	-14.81%
H6-MS	0.560* (0.2463)	2.63%	0.403(0.2612)	1.85%	0.466*** (0.2536)	2.18%	0.602* (0.2452)	2.81%	0.436*** (0.260)	1.94%
H6-Price 1	0.609* (0.2459)	2.86%								
H2- Peer-pressure-1			1.212* (0.2249)	5.56%						
H3-Risk-1					0.801* (0.2194)	3.75%	0.940* (0.3210)	4.39%		
H4-Industry Concerns									0.886* (0.2329)	3.95%
H5- Online Activity-1										
Pseudo R2	0.3504		0.3780		0.3647		0.3585		0.3605	
Wald Test	308.21 (0.0000)		332.48 (0.0000)		320.84 (0.0000)		315.31 (0.0000)		317.08 (0.0000)	
Goodness-of-fit test	23.94 (0.0005)		18.71 (0.0022)		34.03 (0.0000)		36.96 (0.0000)		27.61 (0.0000)	
Correctly Classified	88.50%		89.64%		88.02%		87.45%		88.02%	

\*The dependent variable is 1 if participants illegally downloaded music. Hi=hypothesis i (see Figure 1). Prob is the marginal effect (ME) calculated at the mean. \*, \*\*, and \*\*\* indicate statistical significance at 1%, 5%, and 10%, respectively. Values in parenthesis are standard errors. The Wald-Test verifies that all estimated coefficients are statistically significant predictors of the dependent variable (p-value < 0.05). The goodness-of-fitness test takes the form of a  $\chi^2$  statistics in which p-values higher than 0.05 indicate that the Logit model fits the data reasonably well. Correctly classified is the overall rate of prediction of the model.

Table 8. The probability of illegal downloading of music with Age (Six Models).

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Logit	Prob	Logit	Prob	Logit	Prob	Logit	Prob	Logit	Prob	Logit	Prob
H1-Age	-0.107* (0.0123)	-0.87%	-0.107* (0.0115)	-0.82%	-0.102* (0.0118)	-0.75%	-0.109* (0.0115)	-0.82%	-0.108* (0.0115)	-0.85%	-0.1097* (0.0114)	-0.88%
H1-Gender	-2.0598* (0.2150)	-16.75%	-2.134* (0.2202)	-16.46%	-2.124* (0.2179)	-15.70%	-2.116* (0.2201)	-16.05%	-2.149* (0.2202)	-16.88%	-2.105* (0.2176)	-16.98%
H6-MS	0.179 (0.2435)	1.45%										
H6-Price			0.817* (0.2264)	6.31%								
H2-Peer Pressure					1.211* (0.2076)	8.95%						
H3-Risk-1							0.871* (0.1990)	6.61%				
H5- Online activity-1									0.635* (0.2009)	4.98%	1.145* (0.3256)	8.76%
H4- Industry Concerns											0.2225	
Pseudo R2	0.2199		0.2353		0.2603		0.2414		0.2309		0.2225	
Wald Test	193.46 (0.0000)		206.94 (0.0000)		228.92 (0.0000)		212.36 (0.0000)		203.10 (0.0000)		195.68 (0.0000)	
Goodness-of-fit test	152.72 (0.0000)		29.93 (0.0002)		66.28 (0.0000)		103.34 (0.0000)		58.49 (0.0000)		114.32 (0.0000)	
Correctly Classified	83.56%		86.22 %		86.79%		86.12 %		86.08%		83.56%	

\*The dependent variable is 1 if participants illegally downloaded music. Hi=hypothesis i (see Figure 1). Prob is the marginal effect (ME) calculated at the mean. \*, \*\*, and \*\*\* indicate statistical significance at 1%, 5%, and 10%, respectively. Values in parenthesis are standard errors. The Wald-Test verifies that all estimated coefficients are statistically significant predictors of the dependent variable (p-value < 0.05). The goodness-of-fitness test takes the form of a  $\chi^2$  statistics in which p-values higher than 0.05 indicate that the Logit model fits the data reasonably well. Correctly classified is the overall rate of prediction of the model.



In Model 1 of Table 8, the MS parameter is positive but not significantly relevant. The streaming users are more prone to pirate music by 1.45 %. Similarly, the statement “I did it because it was so much expensive” enhances the probability of committing piracy by 6.31 % (Model 2: Table 8). Whereas, the influence of social groups enhances the likelihood of committing piracy by 8.95 % (Model 3 of Table 8). The beliefs that “there is low or no risk associated with piracy” enhances the probability of committing a crime by 6.61 % (Model 4 of Table 8). While, the statement “It could be done easily and rapidly” enhances the likelihood of piracy by 4.98 % (Model 5 of Table 8). The views that piracy does not harm the music industry enhance the probability of music piracy by 8.76 % (Model 6 of Table 8). In Table 8, the parameters of Price, Peer-Pressure, Risk, Online-Activity and Industry Concerns are positive and statistically relevant.

#### **4.4. A current empirical study with the past literature**

##### **4.4.1. Demographic factors**

Our findings show that the negative parameter of occupation validates that student respondents are more prone to download music illegally than non-student ones. Furthermore, the younger respondents are more inclined to download music illegitimately. Our results are consistent with previous studies carried out by Coyle et al. [16], Navarro et al. [45], Kwong and Park [32], Gupta et al. [22], and Malin and Fowers [37]. It can further be elaborated that the younger respondents have a stronger intentions to download illicitly. Students of high school with an addiction problem to the internet are more likely to pirate. Moreover, students have the computer skills required to easily share files online.. Students, having the maximum Internet experience, are more inclined to pirate music and movies.

Male respondents are more prone to download music illegitimately. Our findings are consistent with Chiang and Assane [13], Coyle et al. [16], Cuadrado et al. [17], Malin and Fowers [37], Moon et al. [41] and Navarro et al. [45]. So, Male respondents have a stronger intention to commit piracy. While the male students are less willing to make payments for music. Moreover, a large number of males, having “access to a computer, Internet connection, broadband access and CD burner”, are pirates. Furthermore, male and more educationally capable students are more prone to commit software piracy.

##### **4.4.2. Online activity**

The results show that the parameter of “Online activity -1” is positive and statistically significant at 1% and it enhances the likelihood of illegally downloading music by 4.38%. It is also upheld by a factor “Online Activity-2” which denotes “the frequency of downloading movies in the last 40 days”. The parameter of this indicator enhances the probability of piracy by 8.40% and it is positive and significant at 1%. Previous researches by Borja and Dieringer [9], Rochelandet and Guel [52], Sims et al. [54] and Tan [57] also support our study. Findings validate that streamers and pirates are computer savvy.

#### 4.4.3. Industry Concerns

The participants who believe that “piracy does not harm the music industry” are more inclined to pirate music by 4.85%. Its results are positive and significant at 1%. Our findings are similar to previous studies by Borja and Dieringer [9], Ingram and Hinduja [31], Maruna and Copes [39] and Morris and Higgins [42]. It validates that pirates are sure that no harm is done to the industry.

#### 4.4.4. Risks and Penalties

The values of parameter Risk-1 are linked to “I am sure that it is not a big threat to get caught”, while Risk-2 is associated with “I am sure that if get caught, the consequences would not be so severe”. Both statements regarding “the perceptions of low or no risk” enhance the probability of piracy by 4.24% and 1.73%. Risk-1 is positive and significant at 1%. However, the Risk-2 parameter is positive but not statistically significant at 5%, providing poor evidence that there is a relationship between music piracy and the perception of low or no risk. Our findings are similar to previous studies by Borja and Dieringer [9], Borja et al. [10], Coyle et al. [16], Hoon et al. [26], McCorkle et al. [40], Nandedkar and Midha [43], Pryor et al. [50] and Shanahan and Hyman [53]

#### 4.4.5. Peer Pressure

Both parameters of factor peer-pressure – 1 and 2 are positive and statistically relevant 1%. The beliefs that “My friend and I did not believe that doing so was wrong” enhances the probability of piracy by 5.93%; while the beliefs that “We did this all the time” enhance the likelihood of piracy by 6.47%. Previous studies by Borja and Dieringer [9], Borja et al. [10], Chiou et al. [14], Hoon et al. [26], Ingram and Hinduja [31], LaRose and Kim [33], Manski [38] and Rochelandet and Guel [52] supported our research.

#### 4.4.6. Price and Music streaming

##### 4.4.6.1. Price

Both statements of Price 1 and 2 enhance the probability of committing piracy by 3.36% and 5.38% respectively. The results of both parameters are positive and significant at 1%. Previous studies by Borja and Dieringer [9], Borja et al. [10], Cheng et al. [12], Gopal and Sanders [19] and Harrington [23] supported our research. The belief of respondents that the substitutes for listening to music like “streaming, buying tracks online or physical CDs” are more expensive than piracy. It supports that music streaming is not considered a low-priced alternative to piracy.

##### 4.4.6.2. Music streaming

While, the results are significant at 1%, providing strong evidence supporting the sampling effect. My findings support previous studies conducted by Borja et al. [10] and Borja and Dieringer [9]. It is established from these studies that these respondents don't consider streaming as a low-cost alternative to piracy and music streaming is used to get easy access to hits of the day and new artists. In such a case, the business model of

streaming lets accesses easily to the latest releases, subsequently enhancing illegitimately downloading by pirates. Despite streamers' steep growth rate, this may give details of the persistence of illicit digital music sharing.

#### 4.5. Discussion:

The findings of our study validated that students are pirating more music rather than non-students. . Moreover, the marginal impact of the occupation parameter is larger than all variables ranging from 16.29 % and 11.31 %, suggesting that occupation enhances the probability of committing piracy by 16.29 % and 11.31 %.

Furthermore, the marginal impact of all other parameters in our study ranges from 1.45% and 8.95%, suggesting that the non-availability of low-cost alternatives to piracy perceptions, the influence of social groups, risk-related perceptions, beliefs of no harm to the industry and online activity are main factors increasing the probability of pirating music by 1.45% to 8.95%. Similarly, music streaming enhances the probability of committing piracy by 3.16%, confirming that the music streaming services enhances the probability of piracy. However, the marginal impact did not change in spite of adding variables of streaming and age to each parameter in Table 8 and Table 7.

Apart from this, the marginal impact of all other parameters is relatively smaller than previous studies by Borja et al. [10] and Borja and Dieringer [9], suggesting that the factors in our study are likely to increase piracy lesser than the past studies. Though, the marginal impact of all parameters in the study conducted by Borja and Dieringer [9] was much higher than our study which ranges from 26.8% to 44.8%, validating that these factors enhance the likelihood of illegal downloading of music by 26.8% to 44.8%. Another study by Borja et al. [10] found that the marginal impact of all parameters ranges from 57.8% to 23.4%.

In nutshell, music streaming increases music piracy by 3.16% in Pakistan, whereas it increases music piracy by 11.4% in the study by Borja and Dieringer [9] and 23.5% in another study by Borja et al. [10] respectively in the USA. While, The marginal impact of the age factor in our study was very low ranging around -0.88% and -0.75%, while other studies by Borja and Dieringer [9] and Borja et al. [10], age parameter's marginal impact was almost similar to our study i.e. between -0.5% to -1.4%, confirming that the younger respondents are more pirating music than older ones. In addition, the gender parameter in our study is significant and its marginal impact is between -1.0% to -3.7%, authenticating that the male respondents are more downloading music illegally than female ones. Whereas the parameter of gender in the study by Borja and Dieringer [9] is not significantly relevant. However, its marginal impact is almost similar to our study.

Reason: The reason beyond the smaller marginal impact in our study than previous studies is that the less access of internet and technology to the people in Pakistan as compared to other countries especially the USA where the people are enjoying more access to new technology and are pirating more. However, our study confirmed that once access is enhanced, piracy would rise.

## 5. Conclusion

To study the elements determining the role of music piracy and streaming in the behaviour of individuals involved in the illegal downloading of music, 1052 online questionnaires have been completed. In past, few studies have been carried out on music piracy by associating it with a business model of streaming in different countries except Pakistan. Of the total six hypotheses of this study, the sixth hypothesis represents the role of MS among pirates. The results show that the use of streaming services enhances the probability of piracy by 3.16 %, which supports the music streaming's sampling effect. It means that streaming is allowing pirates to listen to hits and new albums of artists and later, they download these songs without making a payment.

The findings of this study further show that streaming is not considered a low-cost alternative to piracy. "Alternatives to listening to music" are viewed as expensive and unreachable and this increases the probability of piracy behaviour among respondents. It was found that the social groups tremendously influence respondents' behaviour and these participants are more inclined to pirate music. "The perceptions about low or no risk associated with piracy and no harm to the music industry" enhance the likelihood of pirating music. Results further exhibit that participants, "comfortable with technology and more involved in online activity", are more prone to pirate.

It was discovered that the male respondents are more prone to commit piracy and in the same way, younger respondents are more inclined to pirate music than older ones. Additionally, the student respondents are more prone to pirate music than non-student ones. Findings indicate that streaming services do not protect the music industry against piracy.

However, the marginal impact of all parameters except the occupation parameter in our study is relatively smaller than previous studies, suggesting that the factors in our study are likely to increase piracy lesser than the past studies.

In Pakistan, Music piracy has damaged the whole industry. Due to this, record companies have shifted to other businesses. The majority of artists, workers and other related stakeholders left this profession. However, few artists, who did not leave the profession, create new songs but soon, it is pirated certainly once released in the market. Because of this, there is a decline in new and creative music in the country. This situation has forced artists to live a miserable life on the one hand and on other hand, no new music is made for people. Apart from this, these trends are discouraging new entrants to join the profession.

Keeping in view findings, we recommend some line of actions.

1. The government should develop a policy to combat music piracy in the county.
2. More resource allocation for the development of new infrastructure of the music industry and other supporting institutions should be ensured.
3. All stakeholders such as music artists, labels, the education institutions should be engaged to create awareness among young people especially students against music piracy.

4. The people should be sensitized about risks and penalties for committing music piracy.
5. The government should enforce strictly the anti-piracy and copyright laws.
6. In accordance with new technology accessible to consumers, laws and rules should be amended and updated to control music piracy in the country.

## 6. The Potential Directions for Future Studies

Our study focused on factors enhancing music piracy and future study could investigate what kinds of value-added music streaming services are more attractable to the music listeners rather than committing music piracy.

### Conflict of interest

The authors declare there is no conflict of interest

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