The Cost of Freemium

Empirical Research on the Freemium Music Streaming Services and their Impact on the Music Industry

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Abstract

Music streaming services (MSSs) are a relative new comer to the online digital music market. As of yet, there has been much apprehension from key stakeholders within the music industry, towards the use of the freemium pricing model by many of the MSS platforms. This research aims to uncover the impact of freemium MSSs within the music industry via an empirical study into the potential incomes of MSSs and revenue levels. Consumers valuation of freemium MSSs were elicited through contingent valuation methods, and a questionnaire was used to measure respondent's willingness to pay (WTP) for a premium service tier, and willingness to listen (WTL) to adverts for a free service tier.

Results showed that the optimum price level for premium streaming services is around 7$ per month, while the optimum level of advertisements were around 3 minutes per hour for the free service. A review of these results along side complementary sources on the music industry showed that freemium MSS services have a high earning potential for record labels and right holders, discourages piracy, and are a valuable tool for artists to promote and earn from their music. All the key stakeholders, record labels, artists, and consumers, stand to benefit from MSSs.

This research hopes to clarify some of the misconceptions and controversy surrounding MSS and foster cooperation between them and key stakeholders in order to reverse some of the negative impact of piracy and digitalization within the music industry.

Key Words: Music streaming services, music commodification, piracy, digitalization, digital music distribution, copyright

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1. Introduction

Free + premium = freemium. This portmanteau, coined in 2006 by Jarid Lukin (Schenck, 2011), is the name of a simple and, to some, controversial pricing strategy. The essence of the freemium strategy is that the product (or service) is offered to consumers in multiple tiers, the first of which is a basic version of the product offered for free, while the further product tiers offer higher value at a price or premium. Because of this flexible design, freemium became a popular business model for online stream-able content such as software, movies, and also music. While the freemium pricing strategy may be working well for some products, there has been a lot of contention surrounding the adoption of freemium within music streaming services (MSSs). The main controversy is that selling streamed music using the freemium model is detrimental to the music industry as a whole, since the majority of consumers will flock to the free tier that reputedly does not generate enough profit for the industry to sustain itself at a turbulent and critical point in its history.

This research paper focuses on the impact of the freemium business model on the music streaming industry and aims to shed some light on the controversy, whether or not freemium is a sound marketing strategy for the main stakeholders in the music industry[1], such as record labels, consumers, and artists. The main tool for answering this latter question has been a survey of consumer's willingness to pay (WTP)[2] and willingness to listen (WTL) for the different product tiers of MSSs. The results of the survey have been

1 In this paper *music industry* and *recording industry* will be used synonymously.

2 The maximum amount an individual is willing to sacrifice to consume a good or avoid something undesirable. The price of any good will fall between a buyer's willingness to pay and a seller's willingness to accept (Towse, 2010; Sinha, Machado, & Sellman, 2010).

used to assess the consumers' preferred price levels for premium service and ad-time tolerance for free service, from where the viability of the freemium marketing strategy is discussed and deduced.

After this introduction, this paper starts off with a review of the major technological changes that have jeopardized the music industry[3] as it was and that have forced the record labels to look to MSSs as a possible answer. An outline of the state of research and relevant literature on MSS related topics is given in chapter three. Chapter four outlines the methodological approach taken to assess consumer WTP and evaluate these results towards an optimum pricing strategy for MSSs. Consequently, the implications of the empirical results of the survey are developed for the music industry and its main stakeholders in section five. The paper then concludes with a review of the research limitation and future research suggestions.

2. A Concise Overview of the Music Industry's History

2.1 Music as a Commodity and the Establishment of the Music Industry (prior 1970s)

"Music is not a singular phenomenon and, hence, is not captured by one definition." (Roy & Dowd, 2010).

Depending on the individual, the concept of music can mean various things, as sociologists, economists, and musicians themselves, tend to perceive music differently. One useful distinction to make is between the aspects of music as "an institutionalized system of tonality", and music as "a commodity" (Roy & Dowd, 2010). At their core, all

3 The research on the history and the current structure of the recording industry has been written from a Western and U.S centric perspective specifically.

musical works are simply creative arrangements of sounds that we can define and analyze via a tonal system using "parameters" such as pitch, harmony, and rhythm. However, for these sound arrangements to be shared between, and distributed among large groups of people, music has gradually been commodified through copyright and different "music data carriers"[4]. When viewing music as a commodity in the economic sense, it can further be classified as an experience good (since music needs to be listened to, or "experienced" in order for consumers to be able to derive its value) and an information good, or a good whose market value is derived from the information (the creative arrangements of sounds) it contains (Hougaard & Tvede, 2009).

Analyzing cultural goods, and music especially, under the lens of commodification, is often viewed negatively. The idea of creating or using music for the purpose of generating money, seems to cheapen and contradict the symbolic and artistic value attributed to musical works as a means of self expression or emotional stimulation (Taylor, 2007). This conflicting viewpoint likely stems from the fact that music and other cultural goods do not "sit around exuding commodity status" and that music "has been commodified… in ways that are different than other commodities, such as, say, corn or iron" (Taylor, 2007, p. 283). Nonetheless, the idea that music is a commodity is generally accepted, however there is no general consensus on when and how this commodification "process" took place and how it affects modern day music consumption (Taylor, 2007; Roy & Dowd, 2010). This is because music has been under a constant state of change,

4 A music data carrier refers to any medium which can store musical sound or information for later reproduction. This includes both physical and digital data carriers such as LPs, or MP3 files, respectively. In other sources musical data carriers are sometimes referred to as audio formats. This should not to be confused with the terms audio coding or audio file formats which are used in this paper to refer to digital music files such as MP3 or AAC specifically (IASA, 1999).

with various cultural, social, and historical drivers working indirectly to commodify and de-commodify music as a product (Taylor, 2007). Despite the seemingly impossible task of untangling the complex historical moments and practices which have shaped music commodification and consumption, Taylor (2006), brings forth three "regimes of music commodification"; pre-modern, mechanical, and electronic.

The pre-modern regime refers to the state in which sound is, in and of itself, the commodity. This form of music commodification has existed ever since artists and musicians have been sharing and exchanging live performances with audiences. The social and cultural value placed on live performances were historically shaped by musicians with the skill to make a living from their performances either as traveling artists or, later, for the most able music professionals who were trained as composers, under the patronage of the church or sovereign leaders (Caroll, 2005).

Another important development was the gradual evolution of various music notation conventions. These notation systems eventually gave way to sheet music, from which musicians gained the ability to print, store, and distribute their musical works via paper which Taylor (2006), categorizes as the mechanical regime of music commodification. Along with the formalization of music notation, and development of sheet music publishing came the ideological development and adaptation of intellectual property right (IPR) and copyright laws for musical works. An early example of this was the patent granted to the composers William Byrd and Thomas Tallis by Queen Elizabeth in 1575, giving them exclusive rights to print and publish polyphonic music for the Church of England (Carroll, 2005). This and similar rights granted by sovereigns in Europe, gave way to an emergent music industry for the production and distribution of

sheet music. Copyright systems protecting the interests of composers and sheet music publishers, continued to develop over centuries through important laws and policies, such as the Statute of Anne from 1709, and the Berne Convention of 1886[5], eventually evolving to the copyright systems in use today (Carroll, 2005; Kretschmer & Kawohl, 2004). Though copyright systems are continuously altered and adapted to account for the changes brought on by "new" developments in musical data carriers, the technological changes routinely out-pace the scope of copyright protection. This issue with be elaborate on further within the literature review in Section 3.

Despite all these historical developments, the formation of the modern music industry beyond the production and distribution of sheet music and the organization of live performances did not occur until the early 20th century. Before then, consumers could only listen to music by attending live performances at bars, cafes, concert halls, and other music venues, or they had to learn an instrument to play sheet music at home.

This state of affairs started to change in 1878, when Thomas Edison recorded “Mary’s got a little Lamb”, on the phonograph, a device that could both record and play back sound on a *phonograph cylinder* (Frith, 1989; Vogel, 2011). Many developments followed upon the creation of the phonograph, such as the invention of the gramophone in 1887. Gramophones used the *flat disc* instead of the *cylinder* to store and play back sounds. Mainly because it was cheaper and easier to mass-produce, the flat disk eventually overtook the cylinder and became the archetype of all the disc formats to come

5 The Statute of Anne (also called the Copyright Act of 1710) was the first enactment to define the copyrights of authors and publishers and to be regulated the British government rather than private actors. The Berne Convention for the Protection of Literary and Artistic Works was the first international agreement governing copyright, signed in Berne, Switzerland in 1886 and came into effect in 1887 (Kretschmer & Kawohl, 2004).

(Frith, 1989; Vogel, 2011). Other important early developments were the invention of magnetic tape recording in 1928, and multi-track recording in 1940 (Albright, 2015).

Little by little the contemporary recording industry we know today established itself on the basis of the technological innovations from the late 1800s to the 1960s. Apart from the inventors and technology manufacturers other functions emerged, such as talent scout, music producer, marketers, retailers, and so forth. Together these stakeholders formed a complete recorded music "supply chain" and came to structure and model the dissemination systems of recorded music (Vogel, 2011; Wueller, 2013).

One thing which is unique about the recording industry is the fact that most of these new functions came under the control of one centralized stakeholder; the record label. When the first record labels started out, they manufactured and sold both the early forms of music players (like the phonograph), and their corresponding data carriers. Once it became clear that it was more profitable to sell the records themselves rather than the machines which played them, labels began to specialize their business model (Wueller, 2013). The standard practice for record labels was to obtain a significant share of the royalty rights of the artistic musical works in exchange for the enforcement of copyright on behalf of the artists. Under this business model record labels worked as two subdivisions; the recording unit, who produced and managed records, and the music they contained, and the publishing unit, who obtained and controlled their artists music copyright (Wueller, 2013).

Along with this set up and through vertical mergers over time, record labels managed to deliver or otherwise control the most critical functions within the supply chain, such as the scouting of new musicians, recording and producing new music,

marketing of new talent and music, copyright protection, and finally distribution (Cameron & Bazelon, 2013; Wueller, 2013).

Record labels became very influential under this state of affairs, and they were able to amass excessive profits during the heydays of the industry[6]. Record labels also used their influence, in cohorts with radio initially and later with TV stations as well as concert organizers, to make or break artists, influence public taste, and to set album prices at the most lucrative level (Vogel, 2011; Wueller, 2013). There did remain some niche markets for new and regional acts that were dominated by (semi-) independent record labels like Blue Note (Jazz), Motown (Soul), Atlantic (Jazz and R+B), and many others (Proctor, Sharp & Brown, 2008; Vogel, 2011). By 1980, the fortunes of all parties involved in the music industry, from artists, technology manufacturers to consumers, were largely defined by six major record labels; Warner Music Group, Capitol/EMI, CBS[7], MCA, PolyGram, and RCA (Burkart and McCourt, 2006, p. 25; Vogel, 2011).

According to Taylor (2006), the impact of the phonograph, and all the technological and institutional changes that followed suit, have altered the conceptualization of music commodification from mechanical to electronic commodification. This classification of music commodification adds a greater layer of complication, as at this point, not only is music itself a commodity, but the data carrier responsible for reproducing the music is also its own complex commodity. And as the technology progressed and musical works were gradually being consumed via multiple data carriers (such as the early flat disks, tapes, and vinyl records along side sheet music

6 The "heydays" or high points of the modern recording industry coincide with the vinyl era from the 1960s to the 1970s and the CD era from the late 1990s to the early 2000s.
7 CBS eventually became know as Sony Music, once it was purchased by Sony in 1988.

and live performances), the commercial value of music became intrinsically tied to the value of these data carriers (Taylor, 2007).

While the success of the music industry was made possible by the technological advances and evolution of music data carriers, ironically, further progress in musical data carrier technologies from the late 1970s onwards reveal dramatic instabilities in the industry. This is clearly demonstrated by the chart below that reveals the per capita music sales per data carrier, for the US market, from 1973 till 2009.

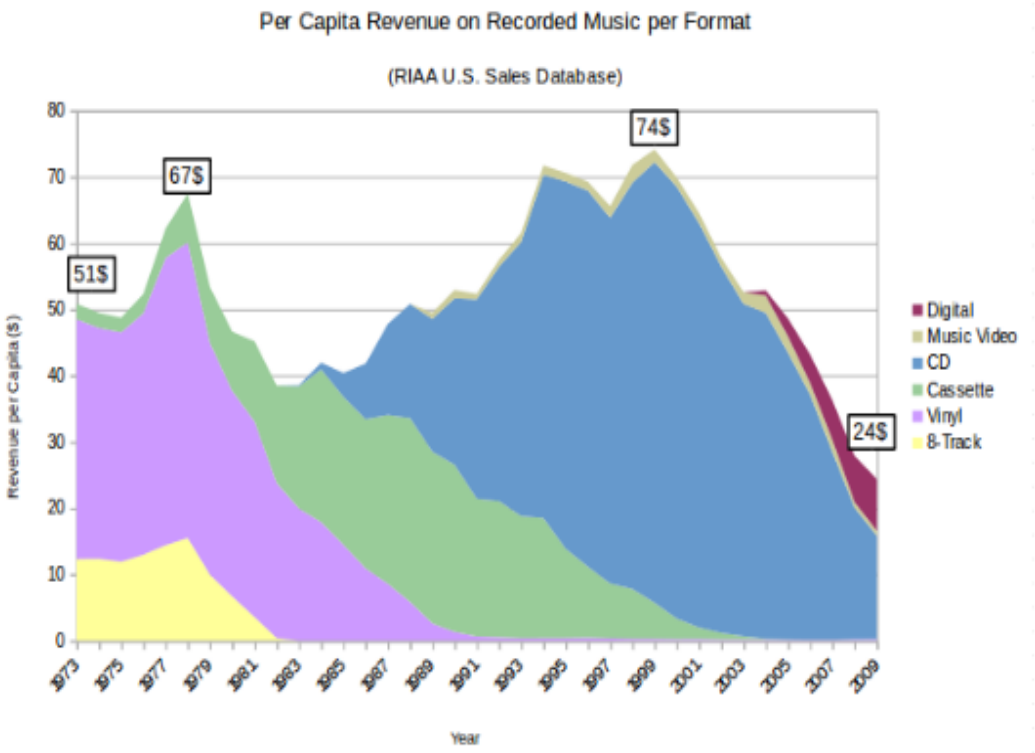

Figure 1. Chart for US Music Industry Per Capita Revenue (Adjusted for inflation from the market year of 2015). This chart was created using the *U.S Sales Database* from Record Industry Association of America (RIAA), in combination with US population data from the World Bank, *World Development Indicators* database (RIAA, 2015; The World Bank, 2017).

This chart shows two peaks in revenue; one short peak during the late 1970s and another one, more persistent, during the 1990s. The first one in 1978, is clearly related to vinyl as a music data carrier, with the average individual spending up to 45$ on vinyl records, and 67$ on music in general. However, this peak does not persist long, and the

vinyl downfall is seemingly brought about by the introduction of cassettes. During the second peak in 1999, the average individual spends up too 74$ on music, with the majority of that amount being spend on CDs. This spike also does not last, and unlike the vinyl peak, the chart does not clearly show a new substitute which has taken its place as the predominant musical data carrier for the record industry. What is clearly displayed from the chart however, is a sequential pattern of evolving technology leading to a series of data carriers substituting each other.

The recent decline in CD sales as shown in the graph, was triggered by a crisis within the music industry as a whole (Albright, 2015; Vogel, 2011). The current unstable state has been credited as one of the effects of digitalization[8] within the music industry as the introduction of the Internet has digitalized music consumption but also undermined licensed distribution channels via illegal file sharing and online piracy[9] (Towse, 2010). While a lot of discussion and speculation within the academic field around the music industry focuses solely on the effects of digitalization, this earlier history of alternating data-carriers (vinyl being replaced by cassettes, and cassettes by CDs), has received far less attention. And given the current financial crisis within the music industry, it appears that consumers valuation of modern musical data carriers are conflicting, leading to inconsistent answers to questions like,

8 Digitalization is defined as the adoption of digital or computer technology by an organization, industry or country (Towse, 2010).

9 In this work, piracy is defined as “the reproduction and distribution of copies of copyright-protected material, or the communication to the public and making available of such material on on-line communication networks, without the authorisation of the right owner(s) where such authorisation is required by law.” ("World Anti-Piracy Observatory - What is Piracy?", 2007).

"Does the music contained on a CD sitting on the shelf in the record store remain the same commodity after it has been ripped from that CD and traded on the Internet?" (Taylor, 2007, p. 282)

Yet, these earlier replacements likely reveal important lessons about music as a commodity and deepen the understanding of the current financial condition in the music industry. We will therefore discuss the technological and commercial properties of prominent data carriers, (vinyl records, cassette tapes, CDs, and the MP3) along with their impact on the key stakeholders (labels, artists, and consumers) in the next section, to ultimately grasp the impact of freemium music streaming services in context.

Broadcast radio, though a critical technological development within the music industry, will not be fully elaborated on within this research. Once music stations were established on the radio in the 1920s, it acted as a complimentary music listening method along side the other musical data carriers we will discuss below. While broadcast radio acted as an important marketing tool for record labels and other stakeholders within the industry, it did not take the place of other data carriers, thus did not cause upheaval within the industry. Because of this, the impact of broadcast radio will not explicitly be explored or discussed in this section.

2.2 A Look Back at Recent Technological Changes and their Impact on Music Industry Stakeholders (1970s and Beyond)

2.2.1 The Vinyl Era (1960-1980)

As previously mentioned, the flat disc was adopted following the invention of the gramophone. Early versions of the disc were 10 inches wide and produced with a compound named shellac, and could only hold up to 3 minutes of music. Around the

1950s producers began using polyvinyl chloride, a type of synthetic plastic, instead of shellac, which resulted in the name vinyl. After initial battles over production and other technical issues (such as rotation speeds), the 33 rpm LP and 45 rpm single[10] emerged as the industry standards in 1964 for vinyl records (Vogel, 2011).

The vinyl record as a means of distributing music had many advantages for right holders (record labels and artists) and consumers alike. Since vinyl records and record players were standardized and affordable for consumers, they could choose what they would listen too, and enjoy their preferred tracks in their own homes as often as they liked with a reasonable sound quality. Yet, it was virtually impossible for consumers to copy the content of the data carrier and they had to handled the records with due care in order to prevent scratches that could severely compromise sound reproduction (Albright, 2015).

The record labels on the other hand, had exclusive control over the production and distribution of vinyl, and could set the prices for EPs[11] and LPs where it was most profitable for them. Because of this opportunity to strategically set prices, the music industry became a hugely lucrative market, and an oligopolistic market system began forming around a few major record companies holding most of the market power (Vogel, 2011; Frith, 1989). Mostly because of the success of vinyl records, the 1960s are remembered as the "golden age of the album" (Albright, 2015).

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10 LP is an abbreviation for Long Play. The LP holds a full album with 30 to 45 minutes of playing time. Singles on the other hand, are vinyl records which hold only 1 to 2 songs maximum on either side of the disk (Roberts, 2006).

11 EP stands for Extended Play. This vinyl record is longer then a single but not long enough to classify as a full-length album. They hold approximately 25 minutes of playing time, or 4 tracks (Roberts, 2006).

2.2.2 The Cassette Tape (1980-1995)

Magnetic tapes had been around since the late 1920s and were generally used for sound recording in the studio. Other tape formats such as the tape cartridge, and the 8-track tape, were introduced in late 1950s and 60s for home use. But it was the cassette tape, first released in 1962, which gradually got a foothold to become the dominant music data carrier by the late 1970s (Albright, 2015). The popularity of cassette tapes was also furthered by the automobile industry, as new cars of the time came out with build-in cassette tape players. This, along with the introduction of the Walkman, a small portable tape player, in 1979 was another complimentary product that propelled tape sales (Albright, 2015). Both developments revolutionized the way individuals listened to music as it enabled personal music collections to become portable.

Aside from the fact that individuals were able to listen to tapes while traveling more easily, there were also a number of critical differences between tapes and vinyl records. Firstly, tapes were smaller and less fragile compared to vinyl records and this increased durability increased tapes' consumer appeal. Another significant difference was the fact that cassette tapes could easily be reproduced and copied. By the 1980s home recording technology had become very affordable, and with a blank tape and a tape recorder individuals could record and transfer songs from the radio and vinyl records onto tapes with a slight, but still acceptable, reduction in sound quality (Albright, 2015; Vogel, 2011). All these new developments allowed consumers to design their own personalized play-lists and listen to them at home and on the go. Although tape cassettes were more durable, cassette players themselves were not fail-safe and had the tendency to

"eat"[12] tapes. Still, the new technology was much appreciated by consumers as it gave them more choice and power over the music they could listen to at a reduced cost (Albright, 2015).

While consumers appreciated the recording technology which allowed them to create their own mix-tapes, on the flip side, it meant that record labels and artists, along with them, lost some of their control over production and distribution. Record companies tried to stop consumers from recording their own cassette tapes and attempted to discourage piracy using campaigns and legal strategies with limited success (Bottomley, 2015; Vogel, 2011). One famous example is the anti-copyright infringement campaign ran by the British Phonographic Industry (BPI) in the 1980s, with the slogan "Home Taping is Killing Music" (Bottomley, 2015).

Figure 2. Logo of 1980 anti-copyright campaign by BPI (Orlowski, 2015).

In the US, legislators also passed the "Audio Home Recording Act" in 1992, which taxed tape recorder manufacturers to compensate of the potential royalties loses faced by record labels, publishers, and songwriters from the recording technology (Vogel, 2011).

Even though "illegal" home taping may have had an affect on the sale of licensed cassette tapes and vinyl's, this affect did not completely undermine sales either. This is due to the fact that the quality of home recording declined per copy and that the

12 Cassettes could be "eaten" or damaged by the player, which was fatal for the cassette, and detrimental for the player.

technology wasn't fail-proof. The consumers of the early 80s still had a major incentive to purchase copyrighted data carriers of which vinyl remained more reliable[13] than cassette tapes (Roberts, 2006). In fact, the sale of cassette tapes only over took vinyl in 1983, a long 30 years after their initial introduction to the market. And vinyl still remained on the scene until the appearance of the CD after which it faced a total collapse in sales for almost two decades[14] (Roberts, 2006).

2.2.3 Compact Discs (1900 - 2005)

With the appearance of the compact disc or CD, which was conceived in a meeting between Philips and Sony in 1979 and introduced on the market in 1982 when ABBA released their album "The Visitors" in CD format, digital sound made its entry in the music industry (Albright, 2015). Where vinyl and tapes are analog music data carriers, the CD is a digital format data carrier that brought along major advancements in technology over the entire music production chain. The popularity of CD's rose for a number of different reasons: they offered excellent audio quality, had a longer playing time than other mediums, and they were much better resistant against dust and finger prints (Albright, 2015). Similar to the progression of tapes, consumers were introduced to CD players for the home, portable versions similar to the cassette - Walkman, and new cars of the time were fitted with CD players. From the early 1990s onwards almost all music album releases have either included a CD (along with vinyl and cassette), or have been released exclusively on CD. Because CDs were initially difficult to copy for the

13 Though vinyls were more fragile in comparison to cassette tapes, they were still more durable overall, as cassette tapes had a tendency to be "eaten" without reason while well cared for vinyls could remain in a good working condition (Roberts, 2006).

14 Vinyl has recently made a somewhat unexpected comeback around 2010 within specific consumer segments (Taylor, 2006).

average consumer, their introduction initially improved the fortunes of the music industry home taping appeared to be less of an issue once consumers began to purchasing CDs. Consumers got soon used to the superior sound quality of the CD and a cassette copy, or even an original, was audibly a poor alternative in comparison (Lynskey, 2015).

The introduction of the CD consequently reestablished the exclusive control of the record labels over production and distribution of high quality audio content that had been compromised during much of the 80s due to the cassette. The record labels could again set prices for CDs at the most lucrative level and the profitability of the industry soared (Lynskey, 2015). However, when more powerful home computers along with specialized software to copy CDs (the CD burner) became a standard item in most every household by the early 2000s, consumers regained some control over their music consumption at a minimal cost by illegally copying and sharing bootleg[15] CDs. As record labels saw the potential threat from these practices, they resumed their fight against illegal copying by means of anti-piracy campaigns and the strengthening of intellectual property laws (Albright, 2015; Lynskey, 2015; Vogel 2011). Academics and industry onlookers alike, argue now that the music industry did itself a disservice by only focusing on these issues, and not paying attention to the long-term impact of new technological developments. As author and music journalist, Stephan Witt stated, "Arguably, it's why they missed the MP3, because they were so concerned about compact-disc burners." (Lynskey, 2015).

15 A bootleg copy is an unofficial release (without the permision of the artist of copyrightholder) of an audio recording of a performance (IASA, 1999).

2.2.4 Audio Coding Formats (MP3) and the Internet (1990 – 2000s)

The introduction of data efficient audio coding formats is seen as the critical development which completely altered the power dynamics between consumers and record labels. This new music data carrier allowed for the transmission of music content over the Internet with negligible loss of sound quality. The most well known format is the MP3 file, the idea of which first came into fruition in 1982, when an electrical engineering student, Karlheinz Brandenburg, was challenged by his thesis supervisor to "find a way to transmit music over digital phone lines" (Albright, 2015; Rose & Ganz, 2011). Brandenburg along with a group of engineers and scientists from the Fraunhofer Institute for Integrated Circuits (IIS) in Germany, started work on the project officially in 1986 (Rose & Ganz, 2011; Witt, 2016). With a patented version of their data compression algorithm ready, the team applied for standardization in 1989 with the Motion Picture Experts Group (MPEG). MPEG was the task force created by the ISO[16] which was in charge of setting "standards for audio and video compression and transmission" (Watkinson, 2001, p. 7). The Fraunhofer team was competing with many other researcher groups during this time, as MPEG initially received 14 applications of different audio coding formats. Finally in 1991, the Fraunhofer data compression algorithm was approved and granted standardization status leading to its official name, MPEG-1 Audio Layer III, or MP3 for short. Their endorsement was granted along side two other formats, MPEG-1 Audio Layer I (MP1), and MPEG-1 Audio Layer II (MP2) (Witt, 2016).

16 International Organization for Standardization (ISO) is a non-governmental international organization which gives specifications for products, services and systems, to ensure qualty, saftey and efficiency ("About ISO", 2016).

Despite its endorsement from MPEG and (by extension) the ISO, the MP3 was continuously passed over by leaders in the film and broadcasting industry, in favor of the MP2. The MP2 was thought to be less “complex” and easier to integrate within radio, TV, and cinema since it required less processing power (Witt, 2016). As a result of this, Brandenburg and the rest of the Fraunhofer team shifted their focus towards online based broadcasting companies instead (Rose & Ganz, 2011).

They released their first software player, *WinPlay3*, to the public in 1995 (Witt, 2016). This software, for which a licensing fee was charged, could decode and replay MP3 files. The corresponding encoding software was to remain too expensive for the general public so that a viable business model could be established (Rose & Ganz, 2011; Witt, 2016). Their growing success of selling decoding and encoding software online triggered another format battle, against both open sourced and proprietary formats, this time for the title of “the internet audio standard” (Rose & Ganz, 2011)

Then, in 1997, professional-grade encoding software (from a client of the Fraunhofer Institute) was illegally released and shared over the Internet for free use (Rose & Ganz, 2011; Witt, 2016). The free copies of encoding software and cheap decoding software were mainly propagated by computer enthusiasts and music pirates in the beginning, who used the newly available software to strengthen the already present “underground” sale of bootleg CDs (Lynskey, 2015). While these early distribution forms were not in the interest of the music recording industry, their impact was initially limited (Lynskey, 2015; Witt, 2016).

Yet, it can be seen, in retrospect, as a metaphorical "Writing on the Wall" for the recording industry as its business model had grown dependent on the full control of

production, marketing and classical distribution channels (Albright, 2015; Cameron & Bazelon, 2013; Vogel, 2011; Witt, 2016).

The pivotal moment came in 1999, with a new online distribution format called Napster, the first peer-to-peer (P2P) file sharing network (Albright, 2015; Lynskey, 2015; Witt, 2016). Napster, and the development of online P2P networks in general was the final blow that appeared to trigger a massive and irreversible decline of CD and album sales over the next years. With free encoding software and widespread access to the Internet, consumers were able to transfer their albums into MP3 files, share these files with any P2P network user, and download and store almost any music of his or her fancy shared by other users, on their personal computer. Within two years, Napster garnered close to 25 million users but was eventually shut down in the legal suit filed against them by the Recording Industry Association of America (RIAA)[17]. Notwithstanding this groundbreaking legal battle, other P2P networks such as LimeWire, Kazaa, and BitTorrent, followed Napster and continued to thrive for years (Albright, 2015; Witt, 2016).

Once executives in the recording industry finally realized that they could not control or stop consumers from using P2P networks regardless of which lawsuits were won, companies within the industry began to develop their own licensed music digital file download services. In 2003, Apple released the *iTunes Music Store* along with its *iTunes 4* multimedia player software. The iTunes music store was the first legal online retail

17 RIAA stands for the *Recording Industry Association of America*, and is the official North and South American record industry trade association which "supports and promotes the creative and financial vitality of the major music companies" ("About RIAA – RIAA", 2016).

outlet where consumers could purchase singles or whole albums, in the AAC[18] audio coding formats. Other recording industry players like *Amazon MP3* and *Google Music* have since followed suit (Albright, 2015).

There are many reasons why MP3 files prevailed so swiftly over CDs. They offer a very good sound quality, are data efficient which made transfer over the internet instant, and a generation of new complimentary music playing devices like the MP3 player, the iPod, and not to forget, the smart phone, made music collections even more portable than ever before (Albright, 2015). And again, following a now familiar pattern, the car industry picked up and facilitated these new developments as well, as contemporary cars are fitted with sound systems compatible with a range of file formats that can be accessed over an USB connection or Bluetooth (King & Lyytinen, 2005). Yet, the most important driver for their unparalleled popularity was likely the virtually free access they offered to an unlimited source of music. The reality that this access was mostly illegal got collectively ignored for the sake of convenience (Rose & Ganz, 2011; Witt, 2016).

The introduction of data compression through audio coding formats has not only made the industry lose control over distribution, sales, and fail in the field of copyright protection, but recording and music production as well (Cameron & Bazelon, 2013). High-quality analogue studio recording equipment was very expensive and record labels had traditionally covered the costs of recording for artists under their label, acting as the gatekeepers between artists and studios. However, as recording technology shifted from analogue to digital, it dramatically reduced the cost of high quality recording. Since the physical cost of digital music production are dependent on the speed of computer

18 AAC is an abbreviation for, Advanced Audio Coding.

processing, the price of high quality recording equipment and post-production editing software continues to decrease as computers become more advance[19]. On top of this, the new opportunities opened up via the Internet have lead to an increase in the "DIY musician", as artists of all styles stepped in to produce, market and distribute their own records thus establishing a direct connection between the artist and the consumer without any involvement of the recording industry (Cameron & Bazelon, 2013).

Though it appears that these changes have appeared to only been positive for consumers, the potential troublesome effect of piracy in the long-term for consumers will be explored in the literature review.

2.3 From Downloading to Streaming

At the onset of the 2000s, the commercial conditions of the music industry can be summarized as follows:

- Due to a number of technological innovations, an unprecedented amount of the recorded musical works, whether copyrighted or not, was freely available on the Internet from a variety of predominantly illegal and alternative sources.
- Consumers could access whatever music they desired (from various genres and eras) for next to nothing. They were faced with a choice between on the one hand illegal access to an intangible music product of high quality at almost no cost, and on the other, legal access to licensed material on mostly physical mediums of about the same quality at a significant (if not inflated) price level.
- The recording industry's persistence on their obsoleting and growingly ineffective business approach resulted in their inability to adapt to and thrive in the new

19 This phenomenon is known as Moore's law (Cameron & Bazelon, 2013).

digital environment. Whether music production, marketing of music and musicians, music distribution, or the protection of copyrighted material, none of the core functions that allowed record labels to run the music industry business in the past, was under their effective control. Despite winning lawsuits and legal pursuits in the attempt to hold on to their traditional business model, the globalization of the Internet allowed piracy practices to continue to the extent that it became commonplace to even ordinary law-abiding citizens.

- The growth of online file sharing and music piracy acted as double edged sword for musicians. On one hand the decline of album sales threatened the prospects of the artists, from well established stars up to undiscovered upcoming talents, in every genre. Yet the with the state of the technology thus advanced, there were many new opportunities available in music production, advertisement, and distribution. With just a computer, artists could record and produce both physical and digital music products of at least acceptable, up to excellent, sound quality at a very affordable price level. And some artists chose to embrace file sharing services as a way to advertise their music with a larger fan base and then sell their music online via online retailers like *Bandcamp* and *Amazon Music*.

It is in this environment that Music Streaming Services (MSSs) enter the music industry arena with the first services starting up in the mid 2000s. Though streaming and downloading are both simply a process of transferring data files from a server to a computer there is a fundamental technical difference between the two. With downloading the consumer must wait for the entire file to be downloaded from the server onto their

computer[20]. As soon as the download is complete, they can engage an MP3 reader on their device to open the file and begin to enjoy the content (Kozamernik, 2002).

With streaming however, the end-user instructs the streaming application on his or her chosen device to play a music title (file) on the server. The streaming platform starts to download the file from the server and buffers a limited amount of data to secure uninterrupted sound reproduction. As soon as the buffer is full (a number of seconds), the streaming application starts to play the file, even though entire file is not yet fully downloaded. Once the file content has been reproduced, it is no longer stored on the device. Needless to say that there are also streaming applications and add-ons available online which do save streamed file on the computer so piracy remains an issue on certain streaming platforms[21] (Kozamernik, 2002).

One of the first mainstream streaming services was Pandora Radio, which launched in 2005. Born out of the Music Genome Project[22], Pandora acted as a type of high-quality online radio service, employing algorithms to generate personal music playlists that would most likely suit each users individual taste. It was also the first music-streaming platform that used the freemium pricing model, offering the service for free, but giving users the choice to pay to remove advertisements (Albright, 2015). Though Pandora secured itself as a discovery tool for consumers interested in

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20 Or other comparable devices, like smartphones.

21 An example of this can be the numerous websites such as *keepvid.com* and *convert2mp3.net* are used to save streamed videos or audio file from YouTube onto the users computer server.

22 The Music Genome Project was started in 1999. It is an algorithm with its purpose being to "capture the essence of music at the most fundamental level". The algorithm applies over 450 attributes to describe songs and organize them and is under the supervisor of a team of musicologists. It is the core technology use by Pandora Media to program Pandora, and meet the musical tastes of its users (Albright, 2015).

predominantly new unknown music, it nonetheless received some criticism from users for the degree of homogeneity from its recommendation engine (Albright, 2015).

Spotify was the next big innovation in MSSs, cofounded by Swedish entrepreurs, Daniel Ek and Martin Lorentzon in 2006 and launched in 2008 (Albright, 2015). “Where Napster is synonymous with the early phase of P2P file sharing, Spotify appears to inhabit a similarly prominent position in the sphere of music streaming.” (Barr, 2013) What really differentiated Spotify from earlier MSS services, was the fact that it offered on-demand selection. In other words, while music streaming services like Pandora do give users some control in what music they will listen to, it remains a passive listening experience similar to radio, as users can not demand what music they want to listen to in real time. Because of this, they are classified as “digital radio” services. Spotify, and other MSS like Tidal and Apple Music which have followed since, are instead classified as “on-demand streaming” services. They offer an interactive listening experience as users can chose exactly songs they want to hear, are generally allowed to listen to an unlimited number of songs, and can create and share playlists with other users, in sense establishing an online community (Albright, 2015).

The advance of MSS has instigated a shift away from downloading, which has been appropriately named the “ownership to access” theory (Barr, 2013). This theory holds several implications for consumer’s valuation of digital music. On one hand, consumers may valuate a downloaded MP3 file more highly, since because they own a copy of the musical work, and can listen and access it whenever they wish. And in that sense, owning a downloaded MP3 file is not that different from owning a physical music product, like a CD. MSSs do not have the same effect value, since consumers are closer

to "renting" digital music files instead of "owning" them (Barr, 2013).

However, it is also possible to contend that consumers would value MSS's over downloading platforms because of the disadvantages of digital music "ownership". As described by author and researcher Andersson,

"… the ephemeral nature of the digital data; your hard disk will ultimately crash, your mobile phone will ultimately be replaced, and your computer inevitably begins to fail after a longer period of use… streaming services like Spotify are believed to make the need for stationary data redundant." (Barr, 2013 pg 12). And along with exhibiting the benefits of non-ownership based music services, MSSs provide an interactive service that caters to the needs and preferences of the individual consumers.

When P2P networks first appeared, music labels and right holders initially used non-market strategies to combat illegal digital music distribution. These measures started off with the standard anti-copyright campaigns, already seen during the 70s and 80s to combat home taping, but eventually became more extreme. Many of these measures, like filing legal charges against pirates, and developing DRM[23] technologies, were seen as ineffective and brought the industry in disrepute from music fans specifically. Because of this, the eventual rise of freemium MSS like Spotify, were hailed by some as the first market based solution to piracy and illegal downloading (Barr, 2013). The assumption is, by offering a basic configuration of the streaming service for free consumers who would initially be inclined to pirate music will instead turn to MSSs. A quote from Rob Wells, the head of the digital music department of Universal Music Group, supported this idea, stating,

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23 In this work, d*igital rights management* (DRM) schemes are defined as "various access control technologies that are used to restrict usage of proprietary hardware and copyrighted works." (EC- Council Press, 2010).

“What I do know about Spotify is that 80 per cent of the user base of the free service have come in from file-sharing services”(Barr, 2013, p. 10). With the free tier still bringing in money via advertising revenue, and consumers who are willing to pay for music being offered a higher quality of service with the premium tier, freemium as a whole appears to be a beneficial strategy and a viable solution for the record industry against the threat of piracy (Barr, 2013; Page, 2013).

Yet, despite its apparent merits, the idea of allowing consumers to listen to an unlimited number of songs without requiring them to pay has also been controversial for some. In 2010, a number of British news outlets reported on the rumor that the recording artist Lady Gaga, had only received 108 pounds from Spotify for her *Poker Face* single, which had been streamed a million times on their service at the time (Brown, 2010; Barr, 2013). Since then numerous news stories have come out reporting on the lack of adequate compensation MSSs offer the musicians in their catalogs (Barr, 2013). Not only has this lead to much controversy, but it has also created a dissension between MSS services that employ a freemium pricing strategy and those that do not. Some prominent musicians like Taylor Swift, have even gone as far as removing their entire catalog from certain MSSs. In a 2014 interview Swift stated,

"With Beats Music and Rhapsody you have to pay for a premium package in order to access my albums. And that places a perception of value on what I've created. On Spotify, they don't have any settings, or any kind of qualifications for who gets what music. I think that people should feel that there is a value to what musicians have created, and that's that." (Dickey, 2014; McIntyre, 2015; Hassan, 2016)

Another development is the growing number of lawsuits musicians and right holders have initiated against MSSs like Spotify and Google Play Music, stating that these services are not paying all the royalities they owe (Levine, 2016; Fried, 2016). However, other sources indicate that MSSs are paying so much in royalty costs that they actually struggle to make profits. Using another Spotify example, it was reported in 2015 that the streaming service paid up to 1.63 billion Euros, or 83.6% of its revenue to record labels, and right holders, and the company has yet to turn a profit since its inception (Levy, 2016).

Though freemium MSS services state that the freemium pricing strategy is necessary to halt piracy and to attract paying subscribers (Ek, 2014), so far there is not a lot of research on the conversion rate from free to premium users. The presence of non-freemium MSS services like Tidal and Apple Music act as circumstantial evidence to the fact that a freemium pricing strategy is not a prerequisite for attracting paying subscribers. The most current reports state that Spotify has passed 50 million subscribers, and is the MSS service with the largest number of premium users (Russell, 2017). However data on the amount of premium users that started with a free tier account, verses the users who subscribed to a premium account straight away, has not been shared by Spofity nor other freemium MSS services.

Despite the issues so far, the potential and prospects of MSSs are undeniable. As the latest development in online music distribution, what makes MSSs so interesting, is that they mimics the convenience of downloading, yet may better cater to the exact preferences of consumers. This is most likely the reason why music streaming services have been able to carve out a strong foot hold within the music industry in a relatively

short period of time. However, as MSSs are proving to be a new income source for artists and right holders, it is worth exploring whether the effect of the free service tier provided by freemium streaming services could be doing more harm than good for the music industry as a whole.

3. Literature Review

3.1 Nature of Research for MSS

So far, empirical research on willingness to pay for streamed music or on the effects of the freemium pricing model on the fortunes of the music industry has been in short supply. Instead, most material on freemium and music streaming is found in news articles and blog posts speculating on the current controversies surrounding different music streaming platforms. These articles (let alone the blog posts) have not been evaluated within the literature review since they are not academically substantiated and consequently lack validation. In actual fact, much of the discourse found in these sources is "highly politicized and poorly evidenced" (Barr, 2013, p. 3). Nonetheless, they have triggered the debate on the impact of freemium on the stakeholders affected by MSSs such as the artists. The issues brought up by these sources will be further elaborated on in the discussion section of the thesis.

Despite the lack of academic literature with an exclusive focus on the overlay between freemium and MSSs, there is research on the topic of digital music in relation to the issues mentioned in the previous chapter, such as copyright, piracy, and WTP. Though piracy and WTP are two distinct concepts, they can be seen as two sides of the same coin. Consumers who pirate digital music can simply be defined as having a WTP

of zero and many of the factors that influence WTP influence piracy as well (Sinha, Machado, & Sellman, 2010).

Consequently, the first three sections of this literature review delve in previous research on, respectively, copyright, piracy and WTP for digital music. This naturally leads to the next section, which explores previous research on the design of pricing models for digital music. Finally the last part takes stock of the state of knowledge on the special case of the freemium pricing model.

3.1.1 Copyright in the age of digitalization

It appears that a lot of the current interest and research into music copyright policy and law has been reignited by the recent technological innovations within the industry. The aim of most research is to determine an adequate level of copyright protection and enforcement for the creative industries. Some researchers theorize that copyright is essential to protect the interests and livelihood of creators, others advocate against, citing strict copyright policy as an instrument that stiffens creativity and innovation within the industry while a third group advances that copyright protection is unwarranted.

Paul Romer (2002) prescribes two main steps for the economic analysis of property right and copyright policies. The first step is to "distinguish(es) rival from nonrival goods", then the second is to determine what welfare effects will follow from the adoption of property rights. Music is categorized as a non-rival[24] good for two reasons. The act of listening to a song by one consumer, does not "diminish" the supply

24 A non-rival good is any good which can be consumed by one consumer without preventing simultaneous consumption by other consumers (Romer, 2002).

of that specific song, it therefore does not impede the ability of another consumer from listening to that same song (Potts, 2014). Secondly, due to the ease of copying, it has an extremely low marginal cost (irrespective of the musical data carrier). Many authors within the copyright debate, like Romer (2002), bring up the non-rival properties of music as a justification for copyright protection. Since non-rival good have such a low marginal cost, they are easily shared making it difficult for creators to regulate how their work is used by the public without a copyright system.

Researchers also argue that digitalization, which has led to a massive increase of unauthorized copying (piracy), has transformed musical works (and other information goods) into de-facto public goods[25]. In this digitalized era, musical works are not only non-rival but have become non-excludable[26] as well. As Towse states: "One of the problems that digitalisation has given rise to is that many 'information goods' are effectively public goods once they are available on the internet, and property rights, mostly copyright, cannot be protected easily." (2010, p. 28).

However, with effective copyright policies, musical works remain excludable. Studies cite varying welfare effects from copyright policies when pertaining to music specifically. One notable economist, Nordhaus (1969), argued, that the welfare effects depend on the degree of the copyright protection granted to non-rival good especially. When a weak level of copyright protection is granted for a non-rivalrous good, the good will be under provided as the creator will receive little compensation for his work and will consequently be disincentivized to create more. On the other hand, when a strong

25 A public good is any good for which the costs of production are independent of the number of people who consume it (Potts, 2014).

26 A non-excludable is any good for which it is not possible to exclude people unwilling to pay, from using the good, therefore, making it difficult to restrict access to the good based on price (Potts, 2014).

level of copyright protection is granted it will lead to “monopoly distortions” by the rightholders. This dilemma was coined as the ‘Nordhaus trade-off’ and has been discussed in numerous papers (Romer 2002) as the gauge for accurate welfare analysis of copyright policy and enforcement. Copyright protection would thus results in a trade off between the interests of consumers (disfavored by monopolies) and creators (disincentivized to create). Though his paper describes the importance of finding the right balance of copyright protection, Nordhaus did not provide rules for an operational balance within different industries (Nordhaus, 1969).

Handke (2010) drew a similar conclusion as Nordhaus; that a successful copyright system should take into account the needs and incentives of both consumers and creators. However, he distinguished between welfare effects over the short - and the long-run. In the short-run, the interest of creators and right holders is to maximize their profit, and the interest of the consumer is to have unauthorized maximum access to the “existing stock of copyright works” (2010). Because of this there isn’t compelling justification for copyright protection in the short-run since there is no way to balance the interests of both sides (as there will always be a trade-off) and imposing copyright policy also includes transaction and administration costs. However, this would change in the long-run. If consumers are given maximum access to copyrighted work for free in the short-run, it will ultimately result in the right holders being unable to recoup the cost of creation. This basically undermines their incentives in the long-run and could lead to lower quantity and quality work, causing the creative supply to eventually “dry up”. Therefore copyright is justifiable in theory, as it would incentivize creators in the long-run which in turn would benefit consumers in the short-run as the short-run benefit of unauthorized copying is

unsustainable (Handke, 2010). He has stated however, that there is incomplete empirical evidence supporting the theory so far, which compromises these contributions to the theoretical framework of copyright welfare analysis to some extent.

In addition to the claim that copyright systems decrease creativity and innovation overall which harms both creators and consumers, others have found evidence that unauthorized copying does not actually harm the content creators and right holders making copyright systems unnecessary from their perspective. A paper by Liebowitz (1985), researched the effects of unauthorized photocopying on the revenue of journal publishers. Liebowitz found that publishers could still capture revenue indirectly from consumers who have not purchased an original copy and that photocopying does not inevitably damage publishers. Publishers could recuperate their costs from unauthorized photocopying via a price discrimination scheme. By charging libraries a higher price, they could cover the loss from unauthorized photocopying in libraries. When discussing the implications of his findings for copyright policies, Liebowitz concluded that more empirical evidence is needed to determine the true effects of unauthorized copying in all creative industries. Besides this, copyright laws will remain ineffective if right holders remain ignorant of the possibilities of price discrimination and indirect revenue generation, and the potential benefits of exposure effects (1985).

Research from Hal R. Varian (2005) tried to answer whether current copyright systems can survive digitalization. In his analysis of previous copyright literature, he found that many authors do not take into consideration that creative works are not only an output from the creative industries, but also an input. While copyright protection can generate income for creators, they also impose boundaries and limit access which

ultimately hinders the ability for copyrighted works to act as an input within the creative industries. Instead, increasing accessibility to creative works by weakening copyright laws would have a stimulant effect and likely lead to an increase in the supply of creative works (Varian, 2005). This is in direct opposition to the theory that copyright laws are needed in order to ensure that optimal levels of creative works are produced.

Another one of the few empirical studies done on the effects of copyright was a 2011 paper done by economist and researcher, Joel Waldfogel. He wanted to answer whether the supply of quality musical works had in fact decreased due to the neutralization of copyright protection after the introduction of Napster. By gathering lists of critically acclaimed albums released over the period from 1960 till 2009, Waldfogel noted that the number of "quality" albums[27] released after the launching of Napster, remained the same (2011).

There appears to be no consensus within the copyright debate, with much of the economic literature on property rights and copyright coming to opposite conclusions despite using similar arguments in welfare analysis. While the literature on copyright systems is conflated, many researchers conclude that it is important to determine to what extent unauthorized copying harms right holders, in order to properly assess if and how to provide the optimal copyright system. A lot of the empirical research, which attempts to answer this question, is being done within the research field of piracy.

27 Waldfogel denoted “quality” based on critics' lists of the best albums of various time periods.

3.1.2 Empirical Research on Piracy

There is no shortage of literature on music piracy with many researchers looking to understand if and how piracy affects music sales. Similar to the copyright debate, there appears to be three common positions taken, with some researchers believing piracy has negatively effected music sales, while others believe there is either no effect, or in some cases, a positive effect.

The 1999 lawsuit of the RIAA against Napster was seen as the causal incident that instigated the interest in the effects of piracy in the music industry. The research headed by the CEO of Sound Scan, Michael Fine, for the lawsuit, was one of the first empirical reports, which attempted to prove the negative effects of piracy on music sales. His main findings were that music sales began to decrease in the US around the same time as Napster was launched. Besides this, Fine cited the fact that CD sales were declining more heavily in record stores near universities. With college students being the largest user demographic of Napster, this was used as evidence for the correlation between their usage of Napster and the decline of CD sales from record stores (Fine, 2000). However, the report was criticized for being biased and too simplistic. Alternative interpretations of the data, such as the possibility that students may have ordered licensed CDs online, where not taken into account in the report (Leibowitz 2005).

In response to this report, Napster put forth the "sampling argument" as a positive effect of file sharing during the court proceedings (Ginsburgh & Throsby, 2006). The argument is that sharing copyrighted music online on P2P networks allows consumers to “sample” the music, which reduces uncertainty and stimulates consumers to purchase the music they like. The 2006 paper by Gopal, Bhattacharjee, and Sanders, attempted to explore this argument formally by studying the incentives behind sampling, purchasing,

and pirating. They concluded that file sharing leads to a decrease in search -, evaluation -, and acquisition costs. This positive effect on consumer surplus has an overall positive effect on purchasing intentions. They also found that attempting to restrict file sharing would be counterproductive in the long-run and sampling can be likened to advertising (2006). However, this argument was also criticized for bias (Towse, 2010). Previously Leibowitz (2005) had already reasoned that it is unlikely for a consumer to purchase a licensed copy of a CD if they already possess a free copy. He also theorized that online "sampling" was actually lowering the prices of online music-listening services and was acting as a substitute for physical music mediums.

Waldfogel (2012) states that, prior to any attempt to prove a correlation between piracy and music sales, it is imperative to quantify the true ratio of sales displacement. For example, if the copyrighted material is valued so highly by consumers that they would purchase the product if stealing (pirating) it is impossible, than pirating one unit of the copyrighted material would decrease paid consumption by one whole unit. This would lead to a ratio of harm for the right holders of "one-for-one" (ratio value of -1). If instead the copyrighted material is not sufficiently valued by consumers to the extent that they would not purchase the product if piracy was impossible, than stealing one unit of the material would not decrease consumption at all (Waldfogel, 2012). Waldfogel attempted to estimate the ratio of sales displacement by running a cross-sectional regression of purchased music on pirated music from 2009 till 2010. He concluded that the displacement ratio is about -0.3 (Waldfogel, 2010). However, Waldfogel stated the figure was only a rough estimate, because, as sharing copyrighted material online is

generally illegal, it was difficult to collect validated data on pirated music (Waldfogel, 2012).

A meta-analysis from Hardy et. al (2015) looks at the available literature on piracy in relation to cultural goods specifically. Despite the large body of conflicting evidence, the analysis concludes that research has not been able to reject the hypothesis that piracy negatively impacts the sale of cultural goods. Following up on this finding (that piracy negatively effects the sales of cultural goods), there is a lot of research on the factors that influence piracy and could perhaps lead to solutions to counter it.

The literature has presented numerous variables, which Sinha and Mandel (2008) have found to adhere to three main categories. These are: positive incentives, negative incentives, and consumer characteristics. The study's findings are that positive incentives (such as decreasing price, and improving quality) significantly reduced piracy amongst all consumers. Yet negative incentives (like DRM[28] schemes, anti piracy campaigns and strict legal repercussions) lowered pirate tendencies in certain consumer segments, but increased them in others, especially among the youth. A paper from Sinha, Machado and Sellman (2010), investigates the impact of DRM on digital music sales. It was found that removing DRM not only lowered piracy but also increased WTP. Particularly, they found that consumers were willing to purchase a DRM free product but resorted to piracy if confronted with a licensed product with DRM.

Another variable, which falls under consumer characteristics, is "free mentality" which relates to the believe that "everything on the Internet should be free". Even though it is a relatively new concept within the piracy literature, researchers have already made

28 DRM stands for *digital rights management*. Please refer to Appendix A for the complete list of abbreviations and acronyms.

some notable findings. Lin et. al (2013) found that, when consumers gain access to free information online, their free mentality builds up. While the presence of such mentality increases piracy tendencies, the researchers also found that it was changeable, citing improved quality, and community features as possible methods to reverse free mentality. An earlier study by Giletti (2011) had comparable results. He found that that younger consumers have stronger belief in free mentality which could however be negated by artist affinity. In conclusion, available research indicates that positive incentives work best to discourage piracy, reduce free mentality, and may increase WTP along consumer segments.

3.1.3 Willingness to Pay

Most of the research looking into WTP for digital music, focuses on downloading rather than streaming. Using a conjoint study design[29], Bamert et. al (2005) found price had the strongest effect on Swiss consumer's WTP for music downloads, while DRM, size of music catalogue, and payment method had little influence. Another conjoint study done in Germany by Buxmann et. al (2005) had similar conclusions and revealed that lowering prices and offering discounts for MP3 files would raise revenue for online distributers. Breidert, Hahsler and Reutterer (2006) followed a different approach, and attempted to measure students' WTP price levels. They concluded that students' marginal

29 Conjoint analysis is a statistical technique used in market research to determine how people value different attributes (features, functions, benefits) that make up an individual product or service (Bamert et. al, 2005).

WTP[30] for digital music decreases per song title, as larger size bundles of songs were offered (to the point that some students had a high WTP for a single over an album).

A paper by Doerr et. al, (2010), is one of the few sources that focus on MSS. They investigated the perceived utility of different configurations of features offered by premium music streaming platforms, and the effects on consumers' willingness to pay. Based on a survey of 132 music streaming users, Doerr found that price was still the most important parameter. Contract duration, music quality, and offline access were also identified as critical parameters for consumer WTP, yet personalization opportunities and community features were not. This research confirms that there is a customer base that is willing to pay for streaming. However, it also shows the need for dedicated research into the difference between market prices and consumers' actual reservation price.

3.1.4 Empirical Research on Price Strategy Design for Digital Music Products

Considerable research has gone into the potential business - and price models for digital music. Ghosemajumder (2002) is noteworthy for having proposed an online business model that is now referred to as the Open Music Model. Though the model was developed with the intent of being usable for all digital information goods, it became known as the Open Music Model because it laid the foundation for business models of current MSSs. Using qualitative methods to assess the effects of P2P exchange on the "social and economic value of information goods", Ghosemajumder designed the online business model to be a commercial system which was "as open as possible" in order to

30 Marginal WTP is defined as "the additional amount consumers are willing to pay for one more unit of a particular good." (Breidert et. al, 2006).

compete with piracy and other forms of free online exchange. It was comprised of five critical aspects; open storage format, open commercial membership, open file sharing, open payment, and open competition. The idea was to create a system that offers consumers the convenience of free exchange networks, while also offering “higher quality content” and “effective distribution”. In the model, all content creators are allowed to register as content creator to the system and are compensated per download. Consumers have to pay for the right to download a certain amount of songs over a certain amount of time. Ghosemajumer determined that the optimal price level for the US market would be 110$ for a yearly subscription which is around 9$ per month. However, lowering this price to 5$ per month would draw in a much larger consumer base and thereby increase revenue. Though modern MSSs such as Spotify have a very similar design to the Open Music Model, they still lack in certain components (such as strictly scheduled payment methods, encrypted storage formats, and limited file sharing possibilities).

A study by Small (2012) concluded that MSSs and music downloading platforms could improve their performance by growing in scale and service. An increased catalog scale would draw in a larger consumer base while superior quality services that optimize “discovery and access”, would incentivize these consumers to pay. Both studies offer recommendations to improve the current business model constants. However, for MSSs to actually implement some of these recommendations, a number of external factors in the form of technological and legal innovations would still need to be developed.

Other researchers have explored alternative pricing strategies. A price discrimination strategy is a very popular option for digital music. Both Gallaway and

Kinnear (2001) and Ko and Lau (2015) have concluded that price discrimination strategies are a good way to increase profit for online music distributors. Gallaway and Kinnear (2001) found that consumers from different age groups show distinct demand elasticities for music and therefore proposed a third degree price discrimination model. Ko and Lau (2015) suggest musicians' fame and popularity should be incorporated in the price of music downloads through consumers' preferences (which they referred to as a "brand premium multiplier"[31]).

It seems that the open music model has been an inspirational starting point for the streaming business. However, because of external factors its unabated implementation cannot be realized at this point in time. Notwithstanding this, it seems that there are ample opportunities to improve the performance of the streaming business by tweaking pricing strategies such as third degree price discrimination, along with consumer adjusted service tiers.

3.1.5 Empirical Research on Freemium Pricing Strategy

Given that the freemium pricing model is still relatively new, it isn't surprising that the volume of academic research is limited. Nonetheless, there are a few published works examining the effects of this pricing strategy on the market of different digital products. One of these papers by Liu et al. (2012), researches the effect of freemium on the mobile application (app) market. For mobile apps the freemium strategy comes in the form of a limited functionality for free (possibly with advertisements) and a full functionality at a premium. Using quantitative methods to analyze a panel data set on

31 The additional monetary unit a consumer is willing to pay depending on the premium brand (popularity) of the musician. Higher levels of fame and popularity lead to a higher brand premium multiplier.

mobile app usage, the researchers found that the freemium strategy positively correlated with increased revenue and sales volume. However this was found to apply particularly for freemium apps with a high rating for their free tier. This suggests that app quality is a precondition for profit.

A more recent paper by Pronitha Shankarananda (2015) used several quantitative methods to analyze what factors led to success within the five companies, LinkedIn, Zynga, Evernote, Spotify and DropBox each applying the freemium model. Shankarananda concluded that size of user network is the most important success parameter. From her finding, it appeared that this diverse set of digital companies had extremely low conversion rates. Because these companies only had a 2 to 7[32] percent chance of converting their free users to paying premium subscribers, attracting a very large network of users contributed most strongly to the companies financial success.

Another study published in 2015 from Fowelin and Uddsten, took a different approach by using qualitative methods. They interviewed a number of app developers from Sweden in order to develop "frameworks for how and why" freemium is employed in the mobile app market. The study indicates that freemium is a good strategy to accomplish both demonstration[33] and word of mouth effects.

These limited sets of studies ascertain that the freemium model can be an advantageous pricing strategy when used correctly. These studies give evidence that the freemium strategy can lead to increased revenue. Digital products being offered with a free tier lead to demonstration effects for the full functionality of the premium tier.

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32 Other sources indicate that the current rate of conversion for Spotify is much higher than 7%.

33 Demonstration effects are effects on the behavior of individuals caused by observation of the actions of others and their consequences (Fowelin and Uddsten, 2015).

However, two out of these three studies focused exclusively on the mobile app market whereas a third one (Shankarananda, 2015) examined just one MSS service provider from a set of five digital product services. Evidently this does not warrant that these conclusions can be extended unabatedly onto the MSSs market and confirms the need for dedicated research as provided in this thesis. For the same reason, the finding of Liu et al. (2012) that ascertain that it is ultimately product quality which lead to higher revenue cannot be extended directly onto the MSS market, which corroborates the need to measure and evaluate the consumer valuation of digital music being sold via freemium pricing strategies.

3.2 Research Questions

It is evident from the multiple findings presented above that piracy is at the heart of the turmoil, which holds sway in the music industry since digitalization. Piracy has in essence nullified the objectives of copyright protection and the debate on the latter's need seems less pertinent. Consequently, the categorization of variables influencing piracy, put forth by Sinha and Mandel (2008), are of critical importance. Negative incentives (such as implementing potentially strict copyright policies) are found to be hardly effective while several of the positive incentives, oriented along the lines of consumer characteristics, do at least work to some extent.

Given all the speculation and controversy surrounding the approach towards piracy, copyright, and the MSS business strategies, the issue ultimately comes down to whether or not freemium MSSs are, or may become, profitable digital music sale and distribution systems, and how this profitability advances the prospects of the entire industry and each of the key stakeholders.

There is little validated information on the profitability of the MSSs, yet the increase of new service providers along with the fact that none of the established legal operators has gone out of business, does suggest that the prospects are promising. Further indications on (potential) profitability can be gained from the steady rise in users (Resnikoff, 2016).

All of this leads to the formulation of the key research question;

- Are MSS services a cure or a curse?; Can music streaming services stop and, potentially, reverse the massive and steady decline of the music industry fortunes brought on by digitalization and piracy, or will they, on the contrary, be the next blow from which it may not recover.

And to the following sub-questions:

- What is the impact of the freemium pricing strategy on the performance of MSSs in terms of revenue and profitability, and on the prevalence of piracy?
- How do MSS and the freemium pricing strategy affect the main stakeholders within the music industry (artists, record labels and consumers)?

4. Methodology

In order to gain insight into the principal research questions, this paper sought to find consumer's valuation of a representative premium service tier and a free service tier by measuring their willingness to pay (WTP) for premium, their willingness to listen to adverts (WTL) for the free service, their preference rate between the premium and free

service, and finally a number of other factors exploring the respondent's music listening behavior, amongst which their engagement in piracy. These variables were appraised in order to assess the optimum price and ad-time levels for the three service configurations (only premium, only free, or only freemium) commonly employed in the MSS business.

Because there has been no prior research published on this aspect of MSSs, critical information needed to complete this research was missing. A questionnaire was consequently designed, tested and distributed online using a convenience sampling method. With the results from the questionnaire, the different analyzes where undertaken using the R Studio package. The questionnaire is presented in the Appendix F.

A complementary source of information was the RIAA U.S. Sales Database, which keeps track of the music industry revenues since 1973 and is quoted to be "*the definitive source of revenue data for the recorded music industry in the United States*" ("U.S. Sales Database – RIAA", 2016). This database presents a detailed history of revenue and shipment data for recorded music works in various data-carrying mediums in North America for over four decades.

The final source of information that was explored in order to respond to the research questions, was the 2014 ruling of the US Copyright Royalty Board (CRB)[34] on the "royalty rates and terms for in a new subscription services" to be in effect from 2016 to 2020 (Web IV, 2015).

Following the findings on the optimum price and ad-time level from the questionnaire, these results would be used in conjunction with music industry revenue

34 U.S. system of three copyright royalty judges who determine rates and terms for copyright statutory licenses and make determinations on distribution of statutory license royalties collected by the U.S. Copyright Office of the Library of Congress.

trends over time from the RIAA data, to assess the prospects of each service configuration within the music industry in general. Information on profitability and prospects has been deducted using the survey results in combination with the CRB royalty rates.

4.1 Choice of Method

The questionnaire employed contingent valuation methods (CVM) in order to gather consumers' WTP and WTL[35] for the two service tiers of freemium MSSs. Traditionally, CVM are used to find the economic value of public goods for which there are no visible market prices like in the field of environmental economics (Carson, Flores, and Meade, 2001). However, CVM have also been used in a number of studies on private - and market goods within both the fields of economics and marketing (Cameron & James, 1987; Hanemann, 1994; Hanemann, Loomis, & Kanninen, 1991). Contingent valuation methods have further been used with success in studies valuating cultural goods, mainly because they give researchers insight in the non-market as well as market values of these goods (Noonan, 2003). Despite the wide usage of CVM, there are many researchers who advocate against this method for a number of reasons. The predominant reason for this is because of the many biases associated with CVM surveys, such as response bias, hypothetical bias, and embedding effect (Heyde, 1995; Hausman, 2012). While other methods have been used to estimate WTP, such as the Van Westerndorp's Price Sensitivity Meter, or Conjoint Analysis, the adaptability of CVM was determined to give better results for the scale and scope of this research. Apart from the fact that CVM seemed more appropriate for this particular study, there is growing evidence that CVM

35 WTP and WTL, are a consumers willingness to pay and to listen. The maximum amount an individual is willing to sacrifice to consume a good or avoid something undesirable.

questionnaires that are well constructed will lead to valid, reliable results. Moreover, in response to the criticism from the economic community, the National Oceanographic and Atmospheric Administration (NOAA) assembled a blue-ribbon panel of economists, led by Kenneth Arrow and Robert Solow, to research CVM studies. The results (Arrow et al., 1993), endorsed Contingent Valuation Methods, and listed a number of recommendations for researchers looking to employ the methods.[36] Other studies (Carson et al. 1996; Carson, Flores, and Meade 2001) found that CVM questionnaires that produced dubious results had numerous issues such as unclear descriptions of the provision mechanisms and payment obligations, unrepresentative sampling, and inadequate administration methods. The questionnaire for this research was designed under the established guidelines and recommendations in order to find the WTP and WTL values for the different product tiers of freemium MSSs.

4.2 Sampling and Data Descriptives

The respondents in the study were selected via convenience sampling. Though convenience sampling may lead to sampling bias[37] and also limits the level of viable extrapolation from the results, it was still the chosen sampling method for this research for two main reasons. Convenience sampling fit the scale and scope of this study while still allowing for a relatively large pool of respondents. In order to limit potential biases and obtain the most consistent and precise results possible, the sampling frame was narrowed down to current users of MSSs and excluded potential users. As current users were the most familiar with MSSs and the general attributes and features of different

36 See Appendix B for the recommendations.

37 Sampling bias is a type of *bias* in which the population sample is collected in such a way that some members of the intended population are less likely to be included than others.

platforms, they were in the best position to understand the questionnaire and give truthful, accurate results to the contingent valuation questions. Using a convenience sampling method was the most feasible sampling technique to "find" current MSS users with the scale and scope of this research. Data collection was done via the Internet, using different social media platforms such as Facebook, Twitter, and Reddit. A number of posts, containing a link to the questionnaire and an explanation of the study, were left on different pages and forums related to popular MSSs, like *Spotify*, *Deezer*, and *Apple Music*. Singer songwriter Victoria Canal[38] also aided in the promotion this research project by sharing the questionnaire on her social media pages with her fan base, the majority of which access her music via Spotify. The explanation briefly informed participants of the purpose of the study, and advertised the opportunity to win a month of *Spotify* or *Deezer* premium for free. Participants were also encouraged to share the link to the questionnaire with friends or acquaintances.

The data collection process was started in early August 2016, and the questionnaire was accessible for a month. It was taken offline in early September when a total of 197 respondents had accessed the link to the questionnaire, of which a total of 154 respondents completed it in its entirety, yielding a response rate of 78.2%.

38 http://victoriacanal.com/home/.

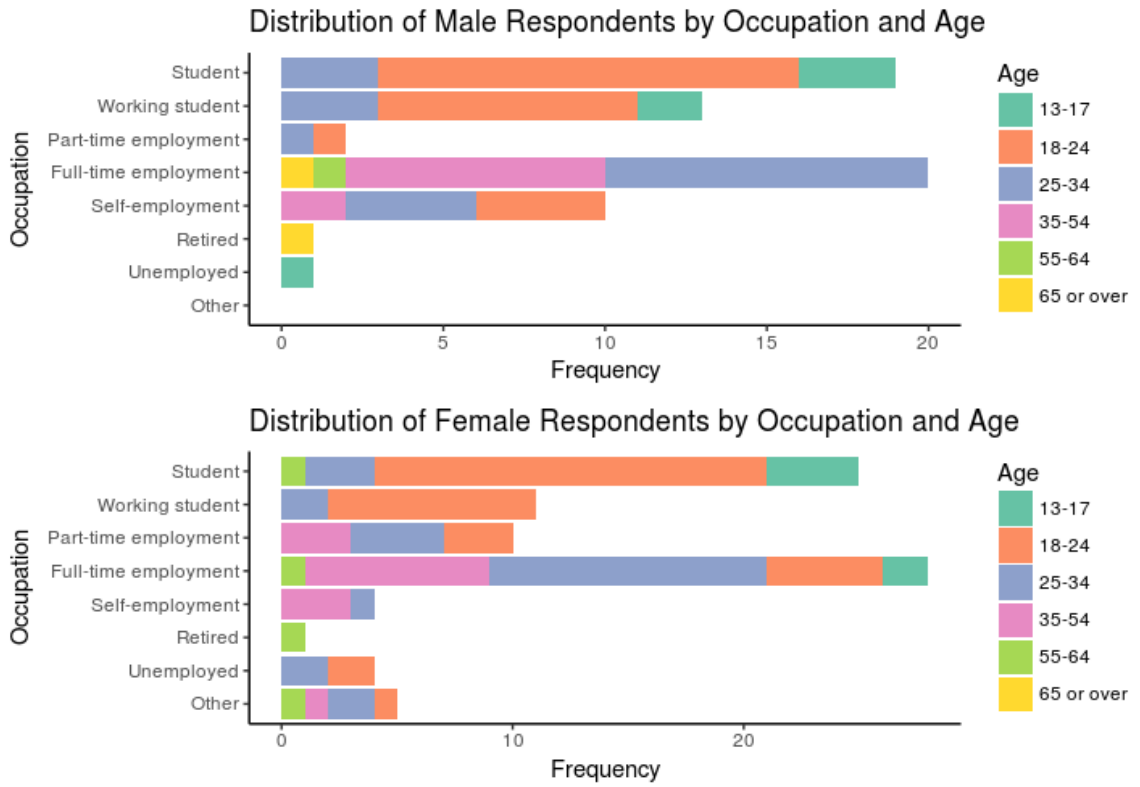

Figure 3. Distribution of respondents across sex, occupation and age

Of the 154 respondents, 88 (57%) were female and 66 (43%) were male. The chart above displays the distribution of respondents through occupation and age for both men and women. For both males and females, student was listed as the most common occupation. Close to half of the entire sample size (44%) were students, though 35% of students (24 out of 68) were working while completing a study. The second most popular occupation was full-time employment, with 31% of the entire sample working a full-time job. The distribution of full-time works and students were relatively equal over males and females. 16% of the respondents were either self-employed or worked part-time. Of the 14 respondents who were self-employed, 10 of them (71%) were male. This was reversed with the 12 respondents who worked part-time, as 10 of them (83%) were female. The remaining participants where either unemployed (3%), retired (1%), or listed their occupation under “other” (3%). The age of the respondents varied from ages 13 to 70,

with the majority of the respondents (63, or 41%) being between the ages of 18 and 24, and the second largest group (47, or 30%) being between the ages of 25 to 34. Unsurprisingly, the majority of respondents between the ages of 18 and 24 were students (75%). And 47% of the respondents between 25 and 34 were working a full-time job. There were 25 respondents between the ages of 35 and 54 (16%). Naturally, the majority of them also worked full-time (64%). Of the remaining respondents, 5% were 55 or older, and 8% were under 18.

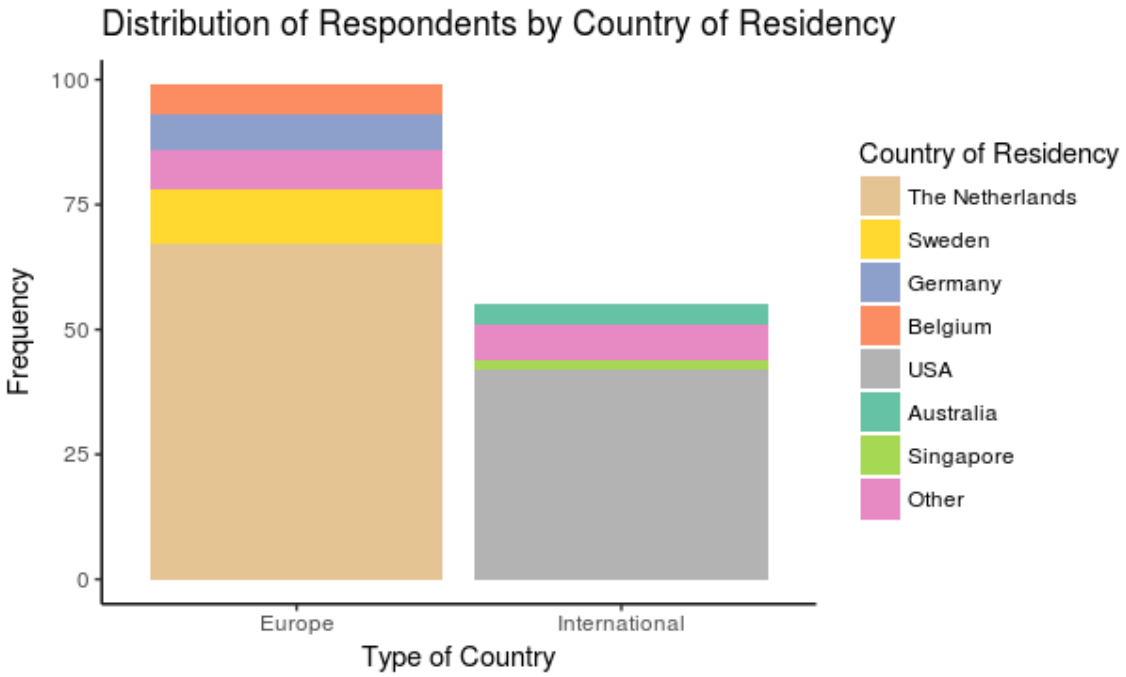

Figure 4. Distribution of respondents across countries

As the questionnaire was hosted online, it was accessible to people outside the Netherlands. In the end, respondents came from a total of 19 countries, of which 64% (99) were from a European country, and 36% (55) were from a country outside Europe. The chart above, shows the distribution of respondents across countries. Close to half of the European respondents were from the Netherlands (44 %), and other prominent European countries were Sweden (7%), Germany (5%) and Belgium (4%). For the

International respondents, 27% were from the US, 3% were from Australia, and 1% were from Singapore. The remaining 15 respondents (9%) were from various countries. Of the 15 respondents, 53% were from the following European countries; the UK, Italy, Greece, Spain and Romania. The other 46% of the remaining 15 respondents were from Canada, Nicaragua, Israel, Egypt, United Arab Emirates, Hong Kong, and New Zealand. For a complete overview of the descriptive statistics, please refer to Appendix C.

4.3 Operationalization

4.3.1 Questionnaire Design

Questionnaire design was one of the most crucial steps in the operationalization process. The questionnaire employed double bound dichotomous choice-based (BD-DC) questions with a referendum style answering system in order to elicit the respondent's valuation of MSSs. This was done following recommendations from previous studies (Arrow et al., 1993; Carson, Flores, and Meade 2001) where it was found that this questioning system reduces hypothetical bias, by mimicking the choices users face in reality between services and product tiers.

Following the recommendations from Carson, Flores, and Meade (2001)[39], the questionnaire was structured as followed. Before starting the questionnaire the respondents were given a brief description of the research and an introduction to the questionnaire. The questionnaire then started with a number of inquiries into respondents' demographic information, their usage of MSSs, and attitudes towards music access in general. This was followed by a thorough description of a hypothetical music streaming service, named *NewMSS*. The attributes and features of *NewMSS* included a large music

39 Please refer to Appendix B.

catalog of over 30 million songs from various genres, online and offline access to the service from multiple devices (smart phone, laptop, gaming console, etc), and no audio adverts.

Following this description, respondents were asked to valuate how much they would be willing to pay per month in order to use *NewMSS*. Though it is possible to employ other questioning styles within contingent valuation methods[40], the double bound dichotomous choice questions were thought to be the best style to elicit the respondents' WTP values for *NewMSS*.

After completely the series of DB-DC questions, respondents where given another thorough description, this time of *NewMSS Basic*, a newly launched edition of *NewMSS*. This section of the questionnaire was structured in the exact same way as the previous one, with the most significant differences to *NewMSS* being that *NewMSS Basic* users had a slightly smaller music catalog of 20 million songs, they were not able to access the service on multiple electronic devices, they could not access the service offline, and they had to listen to audio advertisements between songs[41]. For this section, respondents were asked to valuate how many minutes of audio adverts they would be willing to listen to per hour. And again, like the previous section, DB-DC questions were used to elicit the respondents WTL for *NewMSS Basic*.

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40 Other questioning styles used in CVM surveys include open-ended questions, and single bound dichotomous choice questions (Sinha, Machado, Sellman, 2010).

41 The descriptions for *NewMSS* and *NewMSS Basic* were formed by condensing all the general attributes and features of popular MSSs (such as *Spotify*, *Apple Music*, and *Deezer*). Even though the attributes and features of *NewMSS* and *NewMSS Basic* were based on real MSS platforms, fictitious names were used in the questionnaire in order to elicit unbiased responses unrelated to the respondent's personal view of current popular MSSs.

The DB-DC based questions were structured as follows: respondents were given a number of values sequentially in the form of "bids" and asked whether they are willing, or unwilling to pay these amounts via simple yes, or no questions (a referendum style answering system). All respondents were given the same initial bid within both service tiers (with *NewMSS* representing the premium service tier, and *NewMSS Basic*, representing the free service tier). If respondents rejected the initial bid they were given other bids, whose value depended on whether the respondents were willing or not willing, to pay (or listen to) the previous bids. Using this questioning system, respondents were essentially directed through a number of pathways until they landed on their ideal bid (the bid which corresponded with their true WTP and WTL value the most). The Bid Tree Diagram below, visualizes all the possible paths respondents could take to their corresponding bid.

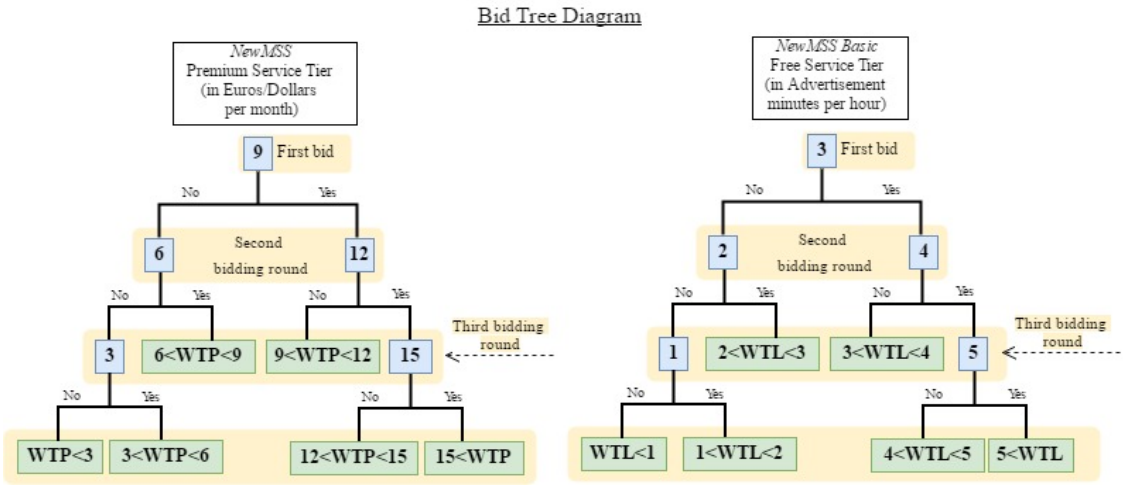

Figure 5. Bid Tree Diagram displaying bidding schemes for WTP and WTL variable

For example, during the evaluation of the premium service, *NewMSS*, a respondent who answered *Yes* to the first bid of 9 would go on to the second bidding round with a bid of 12. If they were to reject this bid, it meant that they had a willingness to pay between 9 and 12 *(9<WTP<12)*, since they were willing to pay 9 but not 12 and

they would be done with this section of the questionnaire. However if the respondent accepted the bid of 12 instead, they would go on to a third round of bidding with a final bid of 15. Their WTP value would fall between 12 and 15 *(12<WTP<15)* if they rejected that final bid, or their WTP value would be greater than 15 *(15<WTP)* if they accept the bid.

As displayed in the diagram, the initial bids were 9 (in either euros or dollars)[42] when respondents were asked to valuate the premium tier, and 3 minutes of adverts when respondents were asked to valuate the free tier. This is because CVM questionnaires employing DB-DC require the bids used to be based on the current prices of the good or service in question, with the idea that using current prices will give the most accurate information on the true population distribution (Sinha, Machado, Sellman, 2010). Reports found on different MSSs indicated that the average price for a premium service is around 9.99 in both the European and International markets according to the Spotify International Pricing Index (Singer, 2014), and that the advertisement level within free services is between 2 and 3 minutes per hour depending on the MSS service (Peterson, 2013). With these pricing and time values, the bid values were centered around an initial WTP bid of 9, and an initial WTL bid of 3, leading to interval data models for the variables of WTP and WTL.

Finally, after respondents completed the bidding sections and indicated their WTP and WTL for each service tier, a number of debriefing questions were asked. This lead to the last section of the questionnaire, where respondents were asked to indicate if they

42 The questionnaire was adapted with two currencies, determined by respondents' responses to the "Current country of residency" question. European respondents were directed to a version of a questionnaire with Euros as the currency, while International respondents were directed to another version with Dollars as the currency.

would prefer to pay for the premium service tier (*NewMSS*) or listen to adverts for the free service tier (*NewMSS Basic*), if both were offered at their previously indicated ideal WTP value or WTL value. The questionnaire was then ended with a few inquiries into respondent's attitudes towards MSSs. Please refer to Appendix G for a full copy of the questionnaire.

4.3.2 Optimization Revenue Models

Following the data collection process, the second half of the research involved appraising the WTP and WTL values, found from the questionnaire, to assess the optimal price and ad amount leading to the maximum revenues within each MSS service configuration. Three different revenue equations were used in order to replication the three different service configurations; *only premium*, *only free*, and *freemium*.

However, the use of CVM methods within the questionnaire design placed certain restraints on the optimization analyses. Specifically the use of double bound dichotomous choice questions within CVM studies, result in a "discrete indicator of WTP" and, in this research, WTL as well (Ahmed & Gotoh, 2006). And because of the structure of the bids, respondents WTP and WTL levels were structured in an interval data model as it was known into which category the respondent's valuations "fell into", but not the exact value of each WTP and WTL observation. Because of the interval censored nature of the data, a parametric analysis had to be used. The most common distributions employed in CVM studies are normal, lognormal, and Weibull distributions (Sinha, Machado, & Sellman, 2010). As the respondents were experienced users of MSSs and had mostly been exposed to a price of 9.99 (in either Euros or Dollars) for streaming services in the past, a degree of normative susceptibility was assumed. This lead to the initial assumption that the data

(especially the WTP variable) would follow a normal distribution with the respondents falling evenly around the bid of 9 for the premium service.

Following the of the data collection process, a Shapiro-Wilk Test was used to test this assumption of normality. The test was significant for both WTP, (W =0.91465, p= 7.09e-08), and WTL (W = .8797, p= 7.61e-10) indicating that the variables were not normally distributed. Thus, upon the Shapiro-Wilk test, Cullen and Fray graphs were used to explore the best distributions for the data. For the WTP variable the skewness (.09) and kurtosis (2.16) statistics suggested that a uniform distribution would be the best fit. The WTL variable was also close to a uniform distribution with skewness (.27) and kurtosis (1.79). However an analysis could not be done under a uniform distribution, and a normal distribution was the next best fit for both WTP and WTL variables according to the Cullen and Fray graphs (please refer to figures *F1* and *F2* in Appendix F). Because of the results from the Cullen and Fray graph, it was decided to search for the optimum price -, and time levels under the assumption of a normal distribution.

A paper by Kerr (2000) tested the accuracy of dichotomous choice contingent valuation data analyzes under parametric distributions. His finding were that while median WTP values were "invariant to distribution", other estimates from CVM data[43] "diverge widely" depending on the distribution used to analyze the data (Kerr, 2000). Kerr recommends applying sensitivity analyses in order to "determine benefit measure response to distributional assumptions" (2000). As such, a sensitivity analysis was done following the normal distribution analysis. This sensitivity analysis was called the Raw

43 The other estimate Kerr referred to in his paper (2000) was the "mean consumer surplus".

Data analysis, since it used the data in its raw form, ignoring the interval censoring intrinsic to the data.

- **Data Preparation**

For both the Normal Distribution analysis and the Raw Data analysis, the WTP and the WTL bid values were transformed as illustrated in the chart below.

Table 1

Data Preparation and Transformations

WTP variable values			WTL variable values		
Respondents WTP levels within the interval data model	WTP bid category name. x_p	Price levels (mid values of bid categories) $B_p = x_p - 0.5 * 3$	Respondents WTL levels within the interval data model (in minutes per hour)	WTL bid category name x_f	Number of adverts (mid values of bid categories) $B_f = (x_f - 0.5 * 1) / 0.5$
WTP<3	3	1.5	WTL<1	1	1
3<WTP<6	6	4.5	1<WTL2	2	3
6<WTP<9	9	7.5	2<WTL<3	3	5
9<WTP<12	12	10.5	3<WTL<4	4	7
12<WTP<15	15	12.5	4<WTL<5	5	9
15<WTP	18	16.5	5<WTL	6	11

Note. B_f is divided by 0.5 in order to converted the bid values to represent number of 30 seconds audio adverts played within an hour, instead of minutes of audio adverts per hour.

Histograms of the WTP and WTL variables following the data preparations are displayed in Appendix F, figures *F3* and *F4*.

- **Normal Distribution Analysis**

Using the results from the questionnaire, probability distribution functions were fitted for both WTP and WTL variables after the values were transformed (Please refer to figures *F5* and *F6* in Appendix F). These functions where then used to model three

different revenue equations, based on three service configurations, only premium, only free, and freemium.

The revenue equation for the premium service per person (R_p) was defined as,

$$R_p = Pr\left(WTP \geq B_p\right) \times B_p \tag{1}$$

Where B_p is the different price levels of premium, and WTP is the willingness to pay.

Revenue from the free service per person (R_f) was defined as,

$$R_f = Pr\left(WTL \geq B_f\right) \times B_f \times r_{ads} \times t_{month} \tag{2}$$

Where B_f are the different number of audio ads per hour of the free service, r_{ads} is the assumed CPM rate[44], and t_{month} is the number of hours listened per month on average. In this case, it can be said that

$$Pr\left(WTP \geq B_p\right) = \phi_{\mu_p,\sigma_p}\left(B_p\right) \tag{3}$$

and

$$Pr\left(WTL \geq B_f\right) = \phi_{\mu_f,\sigma_f}\left(B_f\right) \tag{4}$$

In order to model the revenue gained under a freemium pricing strategy both equations for R_p and R_f are combined into $R_{freemium}$. The equations cannot be added to each other straight away, because of overlap between the two groups. There are people

44 CPM stands for, *cost per thousand impressions*. It is a marketing term, which refers to one of the methods advertisers pay for online advertising. CPM specifically refers to the "cost incurred for every thousand potential customers who view the advertisment(s)" (Bendle, Farris, Pfeifer, & Reibstein, 2010). In equation 2, 7, and 8, it represents the amount of ad revenue earned per amount of audio adverts played.

who are both willing to pay and willing to listen, but choose one of the two product tiers based on their preferences. The models were combined by including the probability variable, p_p, which refers to respondent's preference of paying money over listening to advertisements. When accounting for respondents that would have been counted twice, the freemium revenue was expressed as

$$R_{freemium} = R_p + R_f - \left[\phi_{\mu_f,\sigma_f}\left(B_f\right) \times \left(1 - p_p\right) \times R_p\right] - \left[\phi_{\mu_p,\sigma_p}\left(B_p\right) \times p_p \times R_f\right] \tag{5}$$

All of the equations were maximized in order to find the optimum price and advertisement level that would lead to the highest revenue level. This was done by discretizing the density under the probability distributions of equations 1 and 2, and running a *for*[45] loop over all the possible discrete values for B_p and B_f, respectively (please refer to Appendix H for more information on the R-code used for the analysis).

The numerical integration scheme for equation 5 was slightly different, as the maximum revenue could only be determined by manipulating both B_p and B_f. Since both dimensions of the problem are described by a normal distribution, the results were assumed to follow a unimodal distribution. In this case, the equation was discretized again, and a double *for* loop was run and evaluated the function at each combination of the two dimensions. For each of the three revenue scenarios, the input value(s) associated with the highest found output value was (were) selected as the approximate optimal premium price and/or ad level per hour.

45 One of the basic control-flow construction in the R language.

- **Raw data Analysis**

The raw data analysis followed a similar procedure described for the normal distribution analysis (formula 1 to 5), with the main difference being that a normal distribution was not fitted to the WTP and WTL variables. Once the WTP and WTL variables were transformed as displayed in Table 1, the analysis went as follows.

The revenue for the premium service per person (R_p) under the raw data analysis was defined with the following equation,

$$WTP_R = cf\left(WTP \geq B_p\right)$$

$$R_p = \left(WTP_R\right) \times B_p \tag{6}$$

Where WTP_R refers to the cumulative frequency of respondents by the corresponding bid price (B_p) they are willing to pay.

The revenue generated via the free service tier (R_f) was determined with the equation,

$$WTL_R = cf\left(WTL \geq B_f\right)$$

$$R_f = \left(WTL_R\right) \times B_f \times r_{ads} \times t_{month} \tag{7}$$

Where WTL_R refers to the cumulative frequency of respondents by the corresponding advert amount (B_f) they are willing to listen to. The other variables, r_{ads} and t_{month}, refer to the assumed CPM rate, and the average number of hours respondents listen to music respectively, same as in equation (2).

Finally the freemium service configuration revenue ($R_{freemium}$) was defined as followed,

$$WTP_{freemium} = cf\left(WTP_p \geq B_p\right)$$

$$WTL_{freemium} = cf\left(WTL_f \geq B_f\right)$$

$$R_{freemium} = \left[\left(WTP_{freemium}\right) \times B_p\right] + \left[\left(WTL_{freemium}\right) \times B_f \times r_{ads} \times t_{month}\right]$$

(8)

Where $WTP_{freemium}$ refers to the cumulative frequency of respondents who prefer to pay for premium (WTP_p) at their indicated bid price (B_p). And $WTL_{freemium}$ refers to the cumulative frequency of respondents who prefer to listen to adverts (WTL_f) at their indicated bid advert amount (B_f). And similarly to the Normal Distribution analysis, the input value(s) associated with the highest found output value was (were) selected as the approximate optimal premium price and/or ad level per hour for each of the three revenue models in the Raw Data analysis.

5 Results, Discussion and Conclusion

5.1. Results

This section presents the principal findings from three sources of information which are, combined and in addition to the information from previous research on this topic (see literature review), a prerequisite to unravel the research questions with a reasonable level of confidence. The first source of information is the MSS user survey which was conducted during the month of August in 2016. It shows the perception and valuation of MSS services from the point of view of a rather small sample of MSS users from different countries for 2016. These findings are then combined with the RIAA U.S. Sales Database, and the 2014 ruling of the US Copyright Royalty Board (CRB). The

RIAA dataset presents a detailed history of revenue and shipment data for recorded music works in various data-carrying mediums in the North Americas for over 4 decades. And the CRB ruling of 2014 gives information on the “royalty rates and terms for in a new subscription services”. Because we do not have access to precise cost benefit information from the MSSs, the CRM data, in combination with the results from the questionnaire, allows us to get some insight in the possible profitability of streaming services.

These results are presented in the next two sections.

5.1.1. Questionnaire Results

The key results of the survey were the "willingness to pay" (WTP) values for a premium tier service and the "willingness to listen" (WTL) to adverts values for a free tier service, from a total sample of 154 respondents. As the 154 respondents were either current MSS users, or had previous experience with a MSS service, these responses provide an insight in the collective habits, preferences and responses of the MSS established clientele towards service and price offers by the MSS providers and allow, through this, to establish optimum WTP and WTL levels for maximum revenue, as of early 2016.

The chart below shows the frequencies of respondents spread throughout all the possible combinations of WTP and WTL values, and the corresponding percentages of the total survey population.

Table 2

Cross Tabulation of respondents WTP values against respondents WTL values

			WTL						Total
			1	2	3	4	5	6	
WTP	3	N	15	3	2	3	4	2	29
		%	9.74	1.95	1.30	1.95	2.60	1.30	18.83
	6	N	5	6	12	4	1	3	31
		%	3.25	3.90	7.79	2.60	0.65	1.95	20.13
	9	N	10	5	3	6	5	2	31
		%	6.49	3.25	1.95	3.90	3.25	1.30	20.13
	12	N	15	3	7	10	4	7	46
		%	9.74	1.95	4.55	6.49	2.60	4.55	29.87
	15	N	2	0	0	3	3	4	12
		%	1.30	0.00	0.00	1.95	1.95	2.60	7.79
	18	N	0	1	2	2	0	0	5
		%	0.00	0.65	1.30	1.30	0.00	0.00	3.25
Total		N	47	18	26	28	17	18	154
		%	30.52	11.69	16.88	18.18	11.04	11.69	100.00

Higher frequencies of respondents chose for combinations of relatively low WTP and WTL bids. The lowest WTP bid of 3, and the lowest WTL bid of 1 was one for the most popular combinations, holding 9.74% of all respondents. Another popular combination occurred with the relatively high WTP bid of 12 and the lowest WTL bid of 1, also holding 9.74% of respondents. Few respondents chose for combinations with both a high WTP and WTL bid with none of the respondents opting for the highest WTP bid of 18 along with the highest WTL bids of 5 and 6. The absences of these combinations seems logical, as respondents who are willing to pay the highest bid for a service without adverts are unlikely to be the same respondents willing to listen to many advertisements.

Directly following the bidding section, the questionnaire asked whether respondents would ultimately prefer to pay for a premium service tier with their ideal price (their indicated WTP bid), or if they preferred to listen to adverts for a free service

tier with their ideal advert time (their indicated WTL bid). Please refer to Table D1 in Appendix D which displays the cross tabulation of respondents' WTP and WTL along with their preferred MSS service tier.

The majority of respondents preferred the premium service tier (106, or 69%) to the free service tier (48, or 31%). Yet respondents within the WTP bid category of 3 preferred the free service to the premium service. This is quite logic when reasoning that respondents that prefer the free service, are unlikely to accept any premium bid above the minimum possible. Surprisingly, the bid category of 18 also shows a preference for the free service, but with only 5 respondents overall, this is unlikely to be very meaningful. The spread of respondents within the remaining WTP categories confirmed the preference for the premium service. Amongst the respondents that preferred the premium service, the bidding frequency was highest for the 12 bid, followed by 9, 6, 15, 3 and finally 18.

Of the respondents who favored the free service the majority prefer to listen to just 1 minute of advertisements per hour (13 out of 48, or 27%). Yet, the preference of free service respondents for 2 to 5 minutes of adverts was distributed relatively equally, varying between 15% and 19%. This seems to signal that the number of ads currently applied by most MSSs for their free tier, (2 to 3 minutes of audio adverts per hour) do not necessarily repel free users.

Using the frequencies displayed in the listed charts, it was possible to calculate the following revenue graphs. As mentioned in the method section, the WTP values and WTL were transformed to account of the mid-value of the interval data categories in order to minimize bias. Though respondent's could answer in Euros or Dollars, the

results will be presented in Dollars ($) for coherency. The monthly revenue values calculated for each of the three service configurations (only premium, only free, and freemium) is always divided by the total sample of respondents (154), in order to represent the average monthly revenue per user.

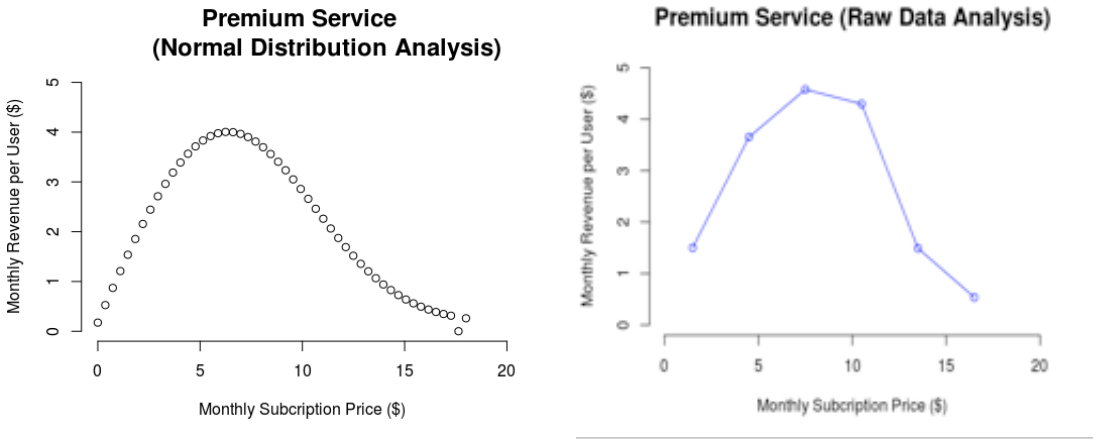

Figure 6. Results of the Normal Distribution and Raw Data analyses for the Premium Service tier Revenues

The first set of analyses was done for the premium service tier the results of which are displayed in Figure 6. The maximum revenue found with the normal distribution analysis was 4.00$ per month per respondent at the monthly subscription price of 6.24$ per month. This was a less than the maximum revenue found when applying the raw data analysis, which was 4.58$ per month per respondent at the monthly subscription price of 7.50$ per month.

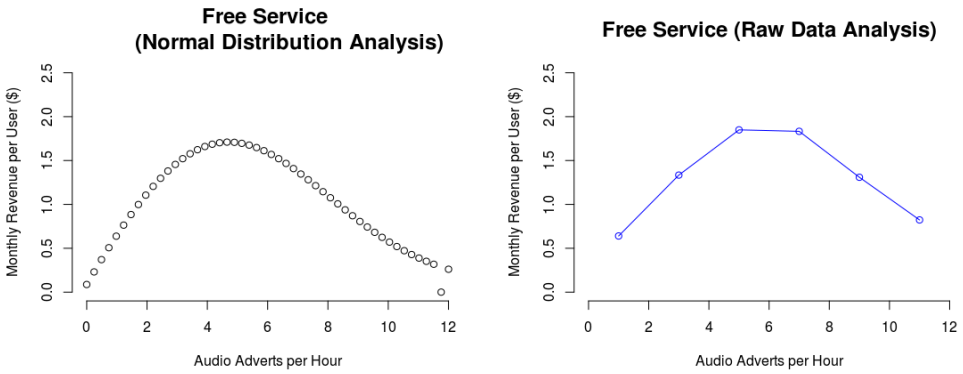

Figure 7. Results of the Normal Distribution and Raw Data analyses for the Free Service tier Revenues

The calculations of potential revenues shown for the free service tier (shown in Figure 7) resulted in a maximum revenue of 1.71$ per month per respondent under the normal distribution analysis and 1.85$ per month per respondent under the raw data analysis. The corresponding optimum number of adverts per hour was 4.65 adverts per hour (resulting in 2.20 minutes of audio advertisements) and 5 adverts per hour (resulting in 2.30 minutes of audio advertisements) respectively.

Following the analyses displayed above, the marginal monthly revenues were calculated with and plotted along side the average monthly revenue calculations for both the premium and free service configuration analyses. This was done to visually validate the results reported in the paragraphs above. For each of the four analyses[46] the marginal revenue curves were equal to 0 and crossed the x-axes at the price levels or audio advert amounts, at which the "corresponding" monthly revenues were maximized. Please refer to figures F7 and F8 in Appendix F.

46 This is referring to the Normal Distribution analysis and Raw Data analysis for the Premium Service configuration, plus the Normal Distribution analysis and Raw Data analysis for the Free Service configuration.

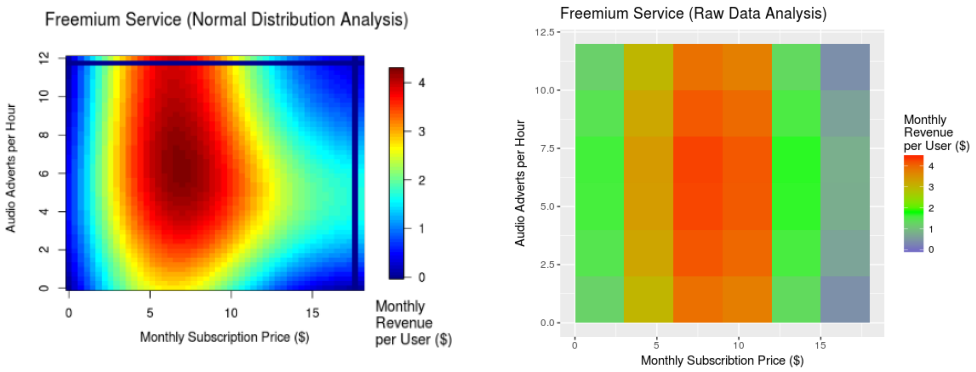

Figure 8. Results of the Normal Distribution and Raw Data analyses for the Freemium Service tier Revenue

Finally, for the freemium service configuration the results of the raw data analysis and the normal distribution analysis (displayed in Figure 8) were very similar, and the raw data analysis was showed an only slightly higher revenue. From the normal distribution analysis, the maximum monthly revenue was 4.27$ with the optimum price level at 6.98$ and the optimum adverts at 6.36 units per hour (results in 3.11 minutes of audio adverts per hour). The maximum revenue under the raw data analysis was found to be 4.28$ with the optimum price being 7.50$ and the optimum number of adverts being 7 (or 3.30 minutes of audio adverts per hour).

In one of the initial sections of the questionnaire, respondents were asked to indicate some of their other preferred methods of listening to music. In order to relate the music listening behavior of respondents and the potential substitutes of MSSs to the other results from the survey, the expanded three-way cross tabulation chart below displays WTP values and preferred service tier against each of the preferred music listening methods. As individual respondents could list more than one method, column percentages are used in the chart below in order to represent the prevalence of the chosen music

listening method, within each WTP category and preferred MSSs service tier, irrespective of the double counted respondents.

Table 3

Cross Tabulation of WTP values and Preferred Service Tier against each of the Preferred Method of Listening to Music

Preferred Method of Listening to Music			WTP																		Total		
			3			6			9			12			15			18					
	Preferred Service		P	F	T	P	F	T	P	F	T	P	F	T	P	F	T	P	F	T	P	F	T
Piracy	yes	N	3	5	8	3	2	5	**10**	4	14	**7**	3	10	1	0	1	0	2	2	24	16	***40***
		%	30.00	26.32	27.59	15.00	18.18	16.13	**41.67**	57.14	45.16	**17.95**	42.86	21.74	9.09	0.00	8.33	0.00	66.67	40.00	22.64	33.33	***25.97***
	no	N	7	14	21	17	9	26	14	3	17	32	4	36	10	1	11	2	1	3	82	32	114
		%	70.00	73.68	72.41	85.00	81.82	83.87	58.33	42.86	54.84	82.05	57.14	78.26	90.91	100.00	91.67	100.00	33.33	60.00	77.36	66.67	74.03
	total	N	10	19	29	20	11	31	24	7	31	39	7	46	11	1	12	2	3	5	106	48	154
Downloads	yes	N	2	2	4	4	0	4	6	1	7	8	4	12	4	1	5	1	1	2	25	9	***34***
		%	20.00	10.53	13.79	20.00	0.00	12.90	25.00	14.29	22.58	20.51	57.14	26.09	36.36	100.00	41.67	50.00	33.33	40.00	23.58	18.75	***22.08***
	no	N	8	17	25	16	11	27	18	6	24	31	3	34	7	0	7	1	2	3	81	39	120
		%	80.00	89.47	86.21	80.00	100.00	87.10	75.00	85.71	77.42	79.49	42.86	73.91	63.64	0.00	58.33	50.00	66.67	60.00	76.42	81.25	77.92
	total	N	10	19	29	20	11	31	24	7	31	39	7	46	11	1	12	2	3	5	106	48	154
CDs	yes	N	5	7	12	10	5	15	12	3	15	16	5	21	8	1	9	0	1	1	51	22	***73***
		%	50.00	36.84	41.38	50.00	45.45	48.39	50.00	42.86	48.39	41.03	71.43	45.65	72.73	100.00	75.00	0.00	33.33	20.00	48.11	45.83	***47.40***
	no	N	5	12	17	10	6	16	12	4	16	23	2	25	3	0	3	2	2	4	55	26	81
		%	50.00	63.16	58.62	50.00	54.55	51.61	50.00	57.14	51.61	58.97	28.57	54.35	27.27	0.00	25.00	100.00	66.67	80.00	51.89	54.17	52.60
	total	N	10	19	29	20	11	31	24	7	31	39	7	46	11	1	12	2	3	5	106	48	154
YouTube	yes	N	6	9	15	16	4	20	18	2	20	23	4	27	7	1	8	2	2	4	72	22	***94***
		%	60.00	47.37	51.72	80.00	36.36	64.52	75.00	28.57	64.52	58.97	57.14	58.70	63.64	100.00	66.67	100.00	66.67	80.00	67.92	45.83	***61.04***
	no	N	4	10	14	4	7	11	63	5	11	16	3	19	4	0	4	0	1	1	34	26	60
		%	40.00	52.63	48.28	20.00	63.64	35.48	25.00	71.43	35.48	41.03	42.86	41.30	36.36	0.00	33.33	0.00	33.33	20.00	32.08	54.17	38.96
	total	N	10	19	29	20	11	31	24	7	31	39	7	46	11	1	12	2	3	5	106	48	154
Radio	yes	N	6	16	22	13	7	20	12	2	4	21	6	27	9	1	10	0	1	1	61	33	***94***
		%	60.00	84.21	75.86	65.00	63.64	64.52	50.00	28.57	45.16	53.85	85.71	58.70	81.82	100.00	83.33	0.00	33.33	20.00	57.55	68.75	***61.04***
	no	N	4	3	7	7	4	11	12	5	7	18	1	19	2	0	2	2	2	4	45	15	60
		%	40.00	15.79	24.14	35.00	36.36	35.48	50.00	71.43	54.84	46.15	14.29	41.30	18.18	0.00	16.67	100.00	66.67	80.00	42.45	31.25	38.96
	total	N	10	19	29	20	11	31	24	7	31	39	7	46	11	1	12	2	3	5	106	48	154
Only MSS	yes	N	1	0	1	1	1	2	0	1	1	1	0	1	0	0	0	0	0	0	3	2	***5***
		%	10.00	0.00	3.45	5.00	9.09	6.45	0.00	14.29	3.23	2.56	0.00	2.17	0.00	0.00	0.00	0.00	0.00	0.00	2.83	4.17	***3.25***
	no	N	9	19	28	19	10	29	24	6	30	38	7	45	11	1	12	2	3	5	103	46	149
		%	90.00	100.00	96.55	95.00	90.91	93.55	100.00	85.71	96.77	97.44	100.00	97.83	100.00	100.00	100.00	100.00	100.00	100.00	97.17	95.83	96.75
	total	N	10	19	29	20	11	31	24	7	31	39	7	46	11	1	12	2	3	5	106	48	154

A very small number of respondents (3.25% or 5 out of 154) indicated that they listen to music via MSSs exclusively. The most popular methods of music listening were YouTube (61.04%), radio (61.04%), and CDs (47.40%). With a prevalence of 22.1% and 26.0% respectively, downloading and piracy were less popular music listening methods. Because piracy has an important influence on the earning potential of MSSs and the music industry in general, a stronger focus was placed on this variable. There is a higher occurrence of piracy within the group of respondents who prefer the free service tier (33.3%) over the respondents who prefer the premium service tier (22.6%). However, when looking at the total frequency of respondents who engaged in piracy, 40, the majority of them had a preference for the premium service (60%, or 24 out of 40). This is interesting as piracy is somewhat predictable for the free service tier group, however it seems as though a significant part of MSS consumers who willing to pay a meaningful price for the premium service, does not want to forego the opportunity to engage in piracy when possible.

A number of chi-squared tests of independence and two sample t-tests[47] were done to further explore the relationship between Piracy, WTP, and other notable variables within the questionnaire. As customary, an alpha level of 0.05 was used for all the tests. Since the majority of respondents who engaged in piracy had a preference for the premium service tier, Preferred Service Tier and Piracy were the first two variables tests. A chi-squared test indicated that the two variables were independent from one another, (X^2 (1)=1.96, p=.16).

47 Even though the Shirpo Wilk test indicated that WTP and WTL were not normal, a Welch Two Sample t-test was still used to explore the relationship between these variables and Piracy. As the Cullen and Frey plots showed, the distributions WTP and WTL were close to a normal distribution and in addition, t-tests are considered to be robust against non-normality (Posten, 1978).

From the results in Table 3, most of the respondents who engaged in piracy were in the WTP categories of 9, 3, and 12 indicating that the tendency toward piracy may be more prominent among certain groups of respondents. This tendency was also visible when looking at the WTP of premium respondents alone. Because of this, it was decided to explore the effect of piracy on WTP, when it was divided into only two categories, Low WTP (the cumulative frequency of respondents with a WTP between 3 and 9), and High WTP (the cumulative frequency of respondents with a WTP between 12 and 18). However, when testing the Low and High WTP values of all respondents against Piracy, the chi-squared test revealed no significant relationship, (X^2 (1)=1.58, p=.21). Looking into the High WTP and Low WTP of respondents who preferred the premium service tier against Piracy revealed similar results (X^2 (1)=3.07, p=.07).

When WTP[48] and piracy were tests using a Welch Two Sample t-test, no statistically significant relationship was found, (t (70.9)= 0.26, p=.78). On average, the mean WTP of respondents engaging in piracy was 8.7 and the mean WTP of respondents not engaging in piracy was only slightly higher at 8.9. Another t-test showed that there was no significant difference between the average WTL of respondents who pirated (M=2.9) and WTL of those who did not (M=3.0), (t (70.4)= 0.21.11, p= .82).

The last chi-squared test of independence was done on Average Time Spent Listening to MSSs per Week against Piracy, though this test also showed no significant

48 Referring to the WTP variable in its original interval form, no longer divided into High or Low categories

interaction between the two variables, (X^2 (7)=9.18, p=.24). Please refer to Appendix E for a complete overview on all the tests.

In conclusion it seems that the optimum price level for this sample rests around 7.50$ per month. This is a little less than the current price most MSS charge (9.99$) for their premium service tier. The optimum advert amount rests between 5 and 7 (which is 2.30 minutes and 3.30 minutes of audio adverts per hour) and is very close to the average 3 minutes of ads popular MSS play within their free tier (Peterson, 2013). Though YouTube and radio were the most popular alternative music listening methods from the sample, 25% of the 154 respondents admitted to engaging in piracy as well. The tests done to explore the relationship between Piracy and other variables, revealed no significant link between piracy and WTP. While the data from Table 3 shows a trend hinting that the pricing of the premium service tier may hold influence over the pirating behavior within MSSs clientele, with no statistically significant test results, it is difficult to accurately assess the strength of the relationship.

5.1.2. Results from Complementary Sources

The complementary information required for responding to the research questions, comes from the RIAA and the CRB. As regards the RIAA data we are mainly interested in the projection of the recent downward trends and will consequently concentrate on the period from 1999 (the peak of CD sales), till present with a particular interest for the period since 2010 when streaming took off.

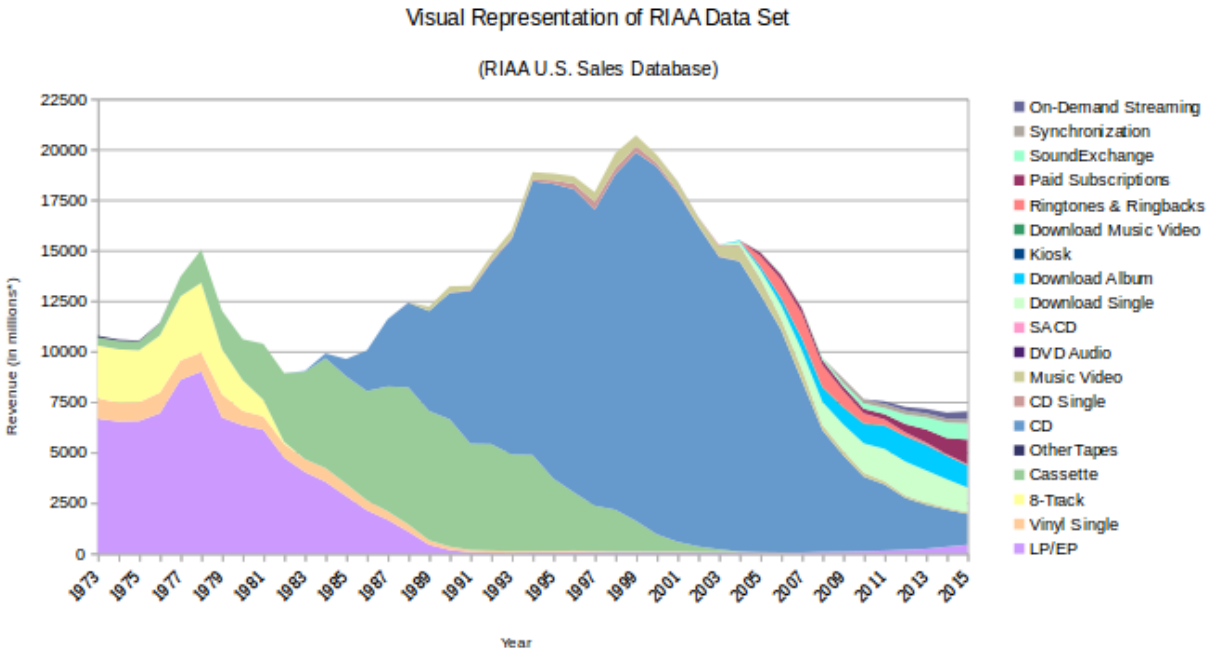

Figure 9. Revenue in millions US$ (Dollar adjusted for inflation from year 2015)

Based on the sales data from the RIAA (Figure 9), it is evident that physical sales in the form of CDs have been dropping dramatically since their peak in 1999. Out of the 21 billion dollars in revenue made from recorded music during that year, a staggering 18.5 billion US dollars was generated exclusively from CD revenues (album and singles combined). Since then, there has been very steep decline of both CD sales and the

industry revenues, until 2010 when the industry established a more or less stable level of revenue around the 7 billion US dollars mark, or at about a third of the 1999 peak level.

However, this “stabilization” within the industry was not caused by stabilization of CD sales. On the contrary, CD sales continued to decrease from 3,7 billion in 2010 to 1,5 billion in 2015, with the annual rate of decline remaining steady at a rate between 10 to 20%. In addition, it does not appear as though the bottom has been reached, and similar to vinyl in the '70s and cassettes in the late '80s, it looks as though CDs may cease to exist as a source of revenue over the coming years due to the fact that modern music listening devices (laptops, smart-phones) no longer cater to them. While vinyl has been making a surprise comeback since 2009, they have been totally absent for at least 20 years and there is less likelihood for CDs to follow suit as they do not hold the same “commodity fetishism” status in terms of nostalgia like vinyl records (Taylor, 2006).

The RIAA data shows that the stabilization of the revenue is caused by a large scale diversification of revenue sources for the industry, including short lived hypes like ringtone sales, somewhat minor revenue sources like synchronization, and, apart from CD sales, three main income generators in the form of legal downloading of CDs, streaming and digital radio (displayed in Figure 10).

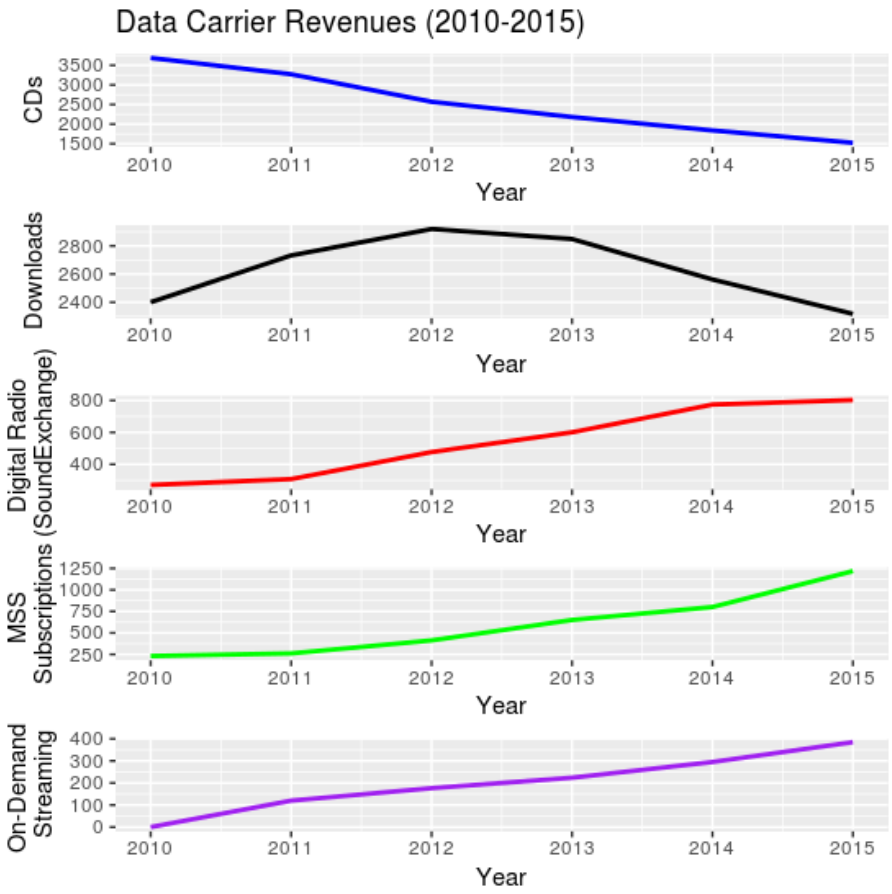

Figure 10. Revenue in millions US$ (Dollar adjusted for inflation from year 2015)

A look at these revenue sources over the period from 2010 to 2015 shows the following developments:

- CD revenues declining from 3,7 billion to 1,5 billion
- Revenue from downloads of singles and albums increased from 2,4 to 2,9 billion in 2012, and then ultimately declines to 2,3 billion by 2015
- Digital radio sound exchange revenues increased from 271 to 803 million
- Premium streaming revenues increased from 231 million to 1,2 billion
- Free streaming revenues increased from 0 to 385 million

It is evidenced from the graph that the revenue from CDs has been declining at a rate between 10 to 20% annually for the last 16 years or so. This decline had been partially compensated (around 20%) with the growth of downloads but this stopped in 2012 when download revenue also started to decrease. A further observation is that both digital radio and streaming have shown continuous growth, of which streaming's has been the most vigorous; while it generated only 3 % of total industry revenues in 2010, it has virtually exploded to make up an amazing 23% of total industry revenue in just five years.

As previously mentioned, it is evident that consumers are less interested in physical data-carriers which is corroborated by the sale of portable listening devices that all integrate towards the multifunctional smartphone, tablets and even laptops, and that no longer cater to them (CDs and tapes). Where this is understandable because they are not as portable and flexible as music files, the recent decline of downloads seems somewhat surprising since they are fully compliant with current devices. The most likely explanation seems that consumers are drifting away from downloading platforms, and towards MSS because the latter are low-cost, and provide a fully interactive listening service of almost any music at any place and any time. Hence, due to this seemingly boundless access to music on remote devices, consumers are not only less interested to own music on physical data carriers, they are also less inclined to own a collection of music files on their music listening or data storage devices mirrored by the “ownership to access” theory (Barr, 2013).

Looking at the trends visible in RIAA data, it seems most likely that the downward trend of the sale of both physical data carriers and downloads will continue for

a number of years to eventually bottom out on the basis of a truly audiophile client base. However, there seems little doubt that the true prospects of the industry are with the sale of services like radio (passive consumption), and most importantly, MSS (interactive consumption).

Finally, in regards to the CRB data, we are mainly interested in their 2014 ruling on "royalty rates and terms for new subscription services" to be in effect from 2016 to 2020 (Web IV, [2015]). It was determined that right holders would received $0.0017 for every song played on any free ad-based streaming platform[50] and $0.0022 for songs played on a premium service tier with subscribers. These figures, in combination with the listening time per month of the average user (refer to Table D2 in Appendix D) and using estimations on the number of songs played per hour, permits to calculate the costs for the royalties to be met with income from a premium subscription paid, and/or from adverts listened to, by the user. These calculations are done and elaborated on, on page 84.

5.2 Discussion

5.2.1. MSSs – a cure or a curse?

Streaming has grown to be a significant source of revenue for the music industry with explosive growth over the past few years. Sources indicate that the worldwide consumer base has just passed the 100 million mark of paid subscribers (MSS and digital radio) and projection indicate that this number may double already in 2017 and reach the 500 million subscribers threshold as soon as 2020 (Resnikoff, 2016).

50 Not only on the free-tier service platforms of Spotify and Dreezer, but also on a website such as YouTube.

Notwithstanding these encouraging growth outlooks, the peak revenues earned by the recording industry during the heydays of vinyl and CD remain a distant and elusive target. Looking back to the RIAA database, the industry collected 15 billion dollars in revenue during the vinyl peak in 1977 and 20.7 billion dollars in revenue during the CD peak in 1999 (values constant in year 2015 dollars), whereas the revenue of the US music industry has rested around 7 billion US$ mark over the last few years.

Another revealing way to view the changes in the yearly revenue levels for the US music market, which was discussed earlier in section 2, is to look at the revenue per capita (please refer back to Figure 1 in Section 2). In 1978, the per capita revenue in the US stood at 67 dollars per person and rose to 74 dollars per person in 1999. The per capita revenue in 2015 however, was 21.8 dollars per person of which 5 dollars had been generated from streaming. In comparison, the potential yearly revenue of the freemium service tier per person to be earned from the sample of 154 streaming respondents, rests somewhere between 51.2 dollars per person (12*4.27$) and 51.4 dollar per person (12*4.28$). However, it is important to remember that 76 dollars could only purchase a handful of albums in 1999, whereas the streamer of today has essentially unlimited access to an extremely large music collection at a per capita spending of around 10 dollars per month. While the optimal price levels found from this research do not generate as much revenue as data carriers from the past, the freemium streaming configuration results in a situation which is consequently much more favorable from the consumer perspective. Even though the per capita revenue generated from streaming appears to be quiet low at the moment, the potential to increase not only per capita, but gross revenue overall, under

the current pricing system for the premium service tier is beyond doubt because the number of clients, in the US and worldwide, can be raised many times over.

If we are to compare the potential revenues generated from the actual prices charged by MSSs the picture becomes even more favorable. The typical MSSs offers a basic premium service tier and a monthly rate of 9.99 dollars (or Euros depending on the market) for the individual subscriber. Many MSSs also offer variations on the premium tier such as providing a family subscription for 6 individuals for 14.99 dollars per month, or offering a super deluxe service tier for 19.99 dollars per month (Singer, 2014). Thus, depending on the MSS platform, streaming clients pay monthly fees that result in annual consumer expenditure varying from about 30 dollars per year (from one individual within the family subscription of up to 6 people) to 120 to 240 dollars per year which is, with the exception of the family subscription, significantly above the average per capita revenue levels brought in by vinyl and CDs in 1977 and 1999. As MSSs continue to attract more subscribers and continue on their way towards becoming the mainstream music listening method, the per capita revenue (related to the overall population) they generate, will increase.

It has already been established from the RIAA data trends, that the industry's sole option to improve its earning potential is to facilitate the growth of MSSs along with digital radio services, because the remaining options (physical sales or legal downloads) may eventually stabilize but do not in the least suggest serious growth prospects.

Notwithstanding their vigorous growth, it is reported that hardly any of the MSS are currently profitable as they continue to experience yearly net losses (Willens, 2016). Unfortunately, we do not know the detailed cost elements required to operate an MSS,

but it is evident that the largest cost component by far are royalties. Despite the fact that the major part of revenue goes towards covering royalties, a number of MSS providers still face numerous lawsuits filed against them from musicians and right holders over unpaid royalties (Fried, 2016).

The premium service tier of music streaming platforms generates profit from the premium paid by their client base against royalties as their main cost component. When MSS services increase their client base, they raise their income and their costs concurrently in a linear fashion. This is because any increase of the user base will result in more streams and in turn more royalty payments. Thus, the streaming industry is facing a "linear profit model" with very limited economies of scale and, notwithstanding its frantic growth, it needs to operate in a manner where it remains profitable with the growing client base.

Looking to the survey results, it is evident that altering (raising) the subscription price is ill-advised not only for reasons of revenue optimization, but also because it may promote piracy. From the slopes in Figure 6, it is clear that premium revenue is highly sensitive to price level. Once the maximum revenue is realized around the 6.24 to 7.50$ price level, the price levels above lead to a sharp decline in revenue due to a significant decrease of the client base. This is further supported when looking at Figure F7 *Marginal Revenues for Premium Service Configuration* in Appendix F, which shows that marginal revenues are equal to 0, at the points of inflection in the average monthly premium revenue curves.

Aside from the fact that an ever smaller client base accepted higher price levels, the clients who rejected higher price level bids were also more likely to participate in piracy

even if they had a preference for the premium service tier. The Welch Two Sample t-tests indicate that there was no significant relationship between WTP and Piracy or WTL and Piracy. However, Table 3 displayed a visible trend between WTP and Piracy, and this was especially notable when analyzing the rate of piracy on WTP when it is divided into two categories, Low and High WTP (please refer to Appendix E, E2 and E3). The cumulative rate of piracy for respondents with a low WTP between 3 and 9 was 29.7% (27 out of 91), which was larger than the piracy rate from the remaining respondents with a high WTP between 12 and 18, of 20.6% (13 out of 63). This relationship was even strong when looking at the Low and High WTP of the premium respondents[51], were the piracy rate of the low WTP premium respondents was 29.6% (16 out of 54), which was almost double the piracy rate of the high WTP premium respondents, at 15.4% (8 out of 52). Though the chi-squared tests were also found to be non significant, the numbers appear to indicate that MSS clients who are willing to pay higher prices engage in less piracy than clients who are willing to pay lower prices. As this holds true for respondents who have a preference for premium, it is possible to infer that when high prices are set, the clients who hold a lower WTP value will not only not want to pay for the service, but they may be more likely to engage in piracy as a substitute music listening method. All the exploratory tests done between Piracy and the other variables proved to not be significant, yet the data hints at interesting trends and relationships, the need for more comprehensive research is clear.

Since the results indicate that raising current prices would lead to a lower revenue (and suggested the possibility of more piracy), the income gained from individual

51 This refers to the 106 respondents who indicated that they held a preference for the premium service tier.

subscribers seems fixed at least for the immediate future. As this is the case, the remaining option for MSSs, is to look towards minimizing the cost structure, with the main expenses being royalties.

Royalty rates are set by the CRB at five year intervals. For the period from 2016 to 2021 they determined a royalty rate of $0.0022 for each song played on a premium service tier with paying subscribers. When assuming an average song duration of 3 minutes (Anisko & Anderson, 2012), the premium subscriber can listen to some 20 songs within one hour on average, since they do not have to listen to any adverts. In this case, the cost of running the premium service tier for one user, for one hour would be 0.044$ per hour (20*0.0022$).

The questionnaire results specify the optimum price level for the premium service tier under the freemium pricing model at or close to 7$ per month and a listening time of 64 hours per month on average. This equates to a price level of about 0.109$ per hour (7$ divided by 64). There is thus a surplus of about 0.065$ per hour (0.109-0.044) which can cover operational costs and may partly turn into an absolute profit.

This picture is not so favorable for the family subscription deal which only covers the average hourly royalty cost if it goes up to 5 people but not up to 6. If 5 people pay $14.99 together, than they each pay about $3 which equates to 0.047$ per hour which is just above the royalty costs of 0.044$ per hour. For a family of 6 each member ends up paying 2.50 $ per month which becomes 0.039$ per hour. Too little to cover the royalty costs of 0.044$ per hour. It seems that there are ample prospects for a profitable exploitation, yet, in their eagerness to gain market share, some streaming platforms seem ready to engage in potentially non profitable contracts.

It is unmistakable that MSSs cater for a novel way of music consumption that has found an eager and growing client base across various demographics (refer to Appendix C) which constitutes a rather effective response to piracy. As such there is little doubt that streaming constitutes, at its core, the principal opportunity for restoring the music industry's fortunes.

However, there are a number of controversies surrounding the MSSs amongst which the non-profitability, the numerous lawsuits on royalty payments and their largely negative image with the other operators of the music industry (mostly artists and record labels).

Considering the number of major operators in the streaming industry[53], they essentially form an oligopolistic market structure and they should collectively aim for rational growth and ethically correct operations. In order to extend their client base, MSS platforms should strive to continue to market their services actively without resorting to loss generating contracts, to diversify their premium service tiers to appeal to as many (new) consumers as possible, to be at all times accountable and transparent for royalty payments, and refrain from exclusive contracts with artists and right holders. Considering their importance for the music industry they should promote their business and clear up their image with the other operators of the music industry particularly with the artists.

53 Some of the major on-demand MSS services are Spotify, Dreezer, Apple Music, Google Music, and Tidal.

5.2.2. Freemium – is it worth it?

As previously mentioned, much of the controversy surrounding the MSSs is because of their adoption of the freemium pricing model. With the argument being that giving users the option between a free and premium service ultimately lead to low revenues as the majority will choose for the free service, creating an unsustainable system which "cannibalizes" itself. However, my results have lead to one main conclusion which negate this idea: that it is possible to generate sufficient revenue from advertisements alone to sustain the costs of running a free service tier.

The survey results revealed that the optimum advert amount which leads to the maximum revenue for the freemium service stands somewhere between 6.36 and 7 audio advertisements per hour. This result was calculated using a CPM[54] rate of audio adverts of $10 (Peterson, 2013), which translates to gaining $0.01 for every 30 second audio advertisement played on the free service tier. And since the results from the questionnaire showed that playing between 6.36 to 7 audio adverts per hour lead to the optimum amount of listeners who generated the highest revenue, we can conclude that MSSs need to be able to cover the costs of running the free-tier from at least $0.0636 to at most $0.07 dollars per hour.

If we assume that the average song is 3 minutes long (Anisko & Anderson, 2012), and we need play up to 3.30 minutes of adverts at most, we can estimate that a user can listen to about 18 songs within one hour on the free-tier service. The cost of listening to 18 songs on the free-tier service would be $0.0306 in total, since each song costs $0.0017 to play. This cost of $0.0306 is fortunately compensated with the ad incomes of both

54 Spotify charges an average CPM of $10 though this rate varies depending on the country, currency, and other applicable variables (Peterson, 2013).

$0.0636 and $0.07, and even leaves a profit for the MSSs between $0.033 and $0.0394 per hour. Although there are many other factors that determine the profitability of the free service tier for the streaming platform, it is indicative that royalty costs are largely covered.

Another important factor to consider is that ad-based services do not rely solely on audio adverts. Asides from selling display ads in the form of banners on their web-based applications, some popular MSS services are also looking to sell advert space on genre specific play-lists to matching advertisers. Such as selling advertising space on a workout play-list to sport brands exclusively (Ingham, 2016). This strategy gives MSSs the wiggle room to increase the ad generated income without necessarily increasing the user base on the free tier service.

So far the RIAA data set for the US shows that the free ad-based streaming revenue for 2015 was 385 million US$. This makes up 5.5% of the total revenue from all sources in 2015 and 16% of the revenue from MSS and digital radio. This comparable percentage was found in the survey results, as revenue generated from the free tier alone, made up about 14% of the total revenue generate from the freemium model. All in all, the ad-based revenue constitutes a significant market share, which would be unwise to forgo for both MSS services selves and for artists and right-holders (assuming registration and payment are correctly processed on the part of the MSS platforms).

Besides the financial benefits, there are a host of other benefits from employing the freemium pricing model. Not only does the free service generate valuable revenue in excess of royalty costs, it is also a tool which extends the scope of services, effectively combats piracy, and as discussed in the literature review, converts potential users into

subscribers via demonstration effects (Fowelin & Uddsten, 2015). It is also an easy place to test new features of the service at a reduced risk. The first argument is that without the facility to attract prospective users to test the service for free in the first place, there wouldn't be many prospective users to refrain ,or not refrain, from becoming a premium client. The second point is that users generate revenue in excess of royalty costs either way; being free or being a premium client.

We therefore consider the free tier a recommended addition to MSSs, from which both MSS and artists (right-holders) benefit. The freemium pricing strategy, although having incited controversy and confusion as a novel market tool is, on the bases of the available data, found to be a sound tool for the music industry.

In addition to the suggestions and recommendations formulated in the preceding section, it is recommended that the streaming platforms continue experimenting with the different methods to convert free tier users into paying subscribers without pushing them into piracy. This part of their business should also be made clear to the other operators of the music industry particularly the artists.

5.2.3. MSS and the Music industry stakeholders – what's in it for me?

So far we have seen that streaming can be a profitable business for the different MSS platforms. With a worldwide client base of currently 100 million users of which 60% are premium clients there are plenty of opportunities. Moreover, this client base is scheduled to grow fivefold and gain around 500 million users worldwide by 2020 (Resnikoff, 2016) so there is little surprise that this market is hotly competed between the streaming platforms.

Unfortunately, the streaming market has encountered some resistance from right holders, record labels and most notable from artists and musicians. While the financial rewards from streaming may not be overwhelming for obscure artists or brand new talents, MSSs do provide a worldwide platform for exposure. Because freemium MSS platforms give their users on-demand access, new artists are discovered via specialized search requests from users that are interested to listen to different genres and styles. In this sense there is scope for synergy between the interests of the two parties.

The rewards for well-known or outright famous artists are even more interesting. For this group of musicians, the issue comes down to comparing the costs and benefits of downloading over streaming. If it is assumed that a famous artist or right holder receives about 1.00$ for a single download, this compares unfavorable with the 0.0022$ per stream from a premium user and the 0.0017$ per stream from a free user. On a one to one basis the premium streamer would have to stream the song 455 times to generate a profit of 1.00$ for the right holder, while the free streamer would have to steam the song 588 times. This looks like a pitiful deal on first sight. However, it is fallacious to assume that every streamed song is a substitute for one download. If the typical streamer is willing to spend 10$ per month on music, it is reasonable to assume that they would be willing to spend about the same amount on downloading on average, if streaming (and piracy) were not possible. For the sake of the argument we can even assume that the streamer would be willing to spend twice that amount[55]. If the monthly budget downloading is 10 to 20, than this allows for some 10 to 20 songs. With 64 hours of streaming and 20 (or 19) songs per hour, the streaming music aficionado roughly listens to around 1200 to 1300

55 Although it seems highly unlikely that the average streamer would be spending more than 20$ on monthly downloads with only 22% of the respondents engaging in music downloading.

streams per month on average. Under this context, the true ratio between downloading and streaming is about 1 download for every 65 streams at best (20 downloaded songs verses 1300 streamed songs per month). But the ratio could be significantly lower at 1 download for every 130 streams (if 10 downloads are allocated for every 1300 streams). In this sense, the artist's deal looks a lot different. When the famous artist's new song gets streamed he foregoes the amount of 0.0154$ (1$ divided by 65) or even just 0.0077$ (1$ divided by 130) from a download by this streamer. Now, if a free streamer only listens to the famous artist's song 9 times, the artist already has an equal deal from streaming that he would receive from downloads in the long-run, and any additional stream only makes the deal better (0.0154/0.0017). A thrifty premium streamer who listens just 4 times (0.0077/0.0022) to the famous artist's new song already constitutes a better deal.

With MSS presenting to be a lucrative means of income for artists and right holders, there are two remaining stakeholders of the music industry that are affected by streaming: the consumers and the record labels. In regards to the consumers, for a fixed monthly payment they have unlimited access to an extremely broad collection of music across many genres. The opportunities for music listening have never been so advantageous for consumers in terms of access and costs. Record labels also stand to benefit. The vigorous growth of the streaming business among new consumers will raise the overall music consumption as well as revenue per person. As the major record labels are still very influential stakeholders who produce and market the majority of the popular music hits, and hold the rights to a very large catalog of music, they will benefit from both these effects.

Possible recommendations for MSSs would be to pay greater attention to royalty payouts and to remain accountable at all times, in order to minimize the backlash of artists and right holders via lawsuits. Admittedly, it is difficult for streaming services to connect streams to copyright holders as more independent musicians and labels release their own music and major record labels no longer streamline the process. Ideally, MSSs and record labels could work together to calculate royalties and payouts under an improved accounting system better suited to the streaming distribution system (Fried, 2016). A further essential aspect is for musicians and the different MSS platforms to work together to keep their music catalogs as open as possible. For example, a current strategy of Tidal is to contract new releases from famous pop artists exclusively on their service (Willens, 2016). Naturally, this will increase the Tidal market share, but is detrimental to overall growth of the streaming industry and consequently for the music industry as a whole. The fact that the main MSS platforms are practically an oligopoly should help them to ensure development strategies by all that aim predominantly at gaining new clients rather than competing for each other's clients.

Also, some of the hostile moves from individual artists against MSS services, such as Taylor Swifts' very public rejection of Spotify in 2014 do not protect musicians interests in the long run (Dickey, 2014; McIntyre, 2015). By pulling their entire music collection off many MSSs, they turn some of their fans away from these services, which again hamper the growth prospects for MSSs and thereby the prospects of the music industry and individual musicians as well.

5.3. Conclusion

In conclusion, the advent of digitalization in the recording industry has lead to much change and turmoil. The aim of this research was to shed light on the effect of freemium music streaming services, and see past the misinformation, and mysteries following these platforms as they continue to find a place in the music industry at large. After reviewing the development of music commodification and the evolution of critical musical data carriers, the key findings are that MSSs are the only current data-carrier which displays growth and has the potential to reverse the fortunes of the music industry. MSS services do discourage piracy and have the potential to significantly raise the amount of royalty revenues brought in for the industry. Finally, the freemium pricing strategy is constructive because it facilitates growth, combats piracy and generates a surplus in excess of due royalty payments. Freemium streaming services also can promote lesser-known artists and present an alternative and likely more rewarding source of income for famous artists. It is concluded that all three of the key stakeholders in the music industry, record labels, artists, and consumers, are set to benefit from the growth of the streaming industry.

It is particularly recommended that MSSs improve on absolutely accountable royalty payments, that they cooperate in offering non-exclusive music catalogs and that they further their growth by aiming at prospective streaming clients instead of rival platforms' clients. Further to advertisements the platforms should thrive for diversification of their contracts for instance based on listening behavior and music genres, and they explore different tactics which could intensify the conversion of free clients to premium clients.

The streaming industry has encountered a lot of negative buzz and resistance so far. These findings, along with further research, are important because they indicate how some of the misconceptions surrounding the MSSs may be ill founded. The music industry has been struggling from the effects of digitalization but further research into this field can reveal how MSSs and the freemium pricing scheme are a benefit, rather than a detriment, to all parties within the music industry.

5.3.1 Research Limitations & Recommendations

Some of the limitations in this research were the size of the dataset. Where 154 respondents seems like an reasonable sample size, it has proven marginally sufficient at best for a full understanding of past, current and prospective streaming and general music listening behavior across age -groups, gender, occupancy, and regionality. On top of this, though convenience sampling was the most feasible sampling method for this study, it did lead to a potentially uneven spread of respondents.

Applying double-bond dichotomous choice based questions set limitations with the questionnaire. This questioning method forced the use of bidding schemes, and starting the bids with 9 (euros / dollars) may have introduced some bias in the form of an anchoring effect. Another issue was the lack of empirical data on the music industry. Though the RIAA data set is very comprehensive, access to a data set of music sales and revenue for the industry on a global scale would have allowed for more broad analysis. Finally, a more explicit investigation on the threat of piracy through the questionnaire would have given more information on how increasing price and ad times may push streaming users to piracy.

In regards to recommendations for further study, it is highly recommended that a similar survey be repeated once a year or once every two years. The survey provides some insight in the listening behavior of streaming consumers which is extremely likely to change over time. Also the sample size should be significantly larger.

Potential research changes for future research would be to experiment with other methods to estimate WTP, such as Conjoint Analysis or Van Westerndorp Price Sensitivity Meter. It is also recommended to experiment with question structures if CVM methods are employed again, such as open-ended questions.

Further to this, it would be interesting to expand research on the cost structures of MSSs so that the true profit prospects between revenue and royalty payments can be assessed with better confidence. While, due to the success of streaming, the impact of piracy seems to be reducing, the problem remains and will of course never disappear. It would consequently be interesting to quantify the problem in terms of losses to the music industry.

Appendices

Appendix A –Abbreviations

List of Abbreviations

The following table defines the various abbreviations and acronyms used through the thesis. The page on which each one is defined or first used is listed in the last column.

Abbreviations	Meaning	Page
AAC	Advanced Audio Coding	p. 22
BPI	British Phonographic Industry	p. 17
CD	Compact Disc	p. 13
CPM	Cost per thousand	p. 60
CRB	Copyright Royalty Board	p. 63
CVM	Contingent valuation method	p. 47
EP	Extended Play	p. 15
DRM	Digital rights management	p. 28
DB-DC	Double bound Dichotomous choice	p. 54
ISO	International Organization for Standardization	p. 20
LP	Long Play	p. 15
MP3	MPEG-1 Audio Layer III	p. 14
MPEG	Motion Picture Experts Group	p. 20
MSS	Music streaming service	p. 5
P2P	Peer-to-peer	p. 22
RIAA	Record Industry Association of America	p. 12
WTP	Willingness to pay	p. 5
WTL	Willingness to listen	p. 5

Appendix B – Recommendations for Contingent Valuation Method Research

Recommendations for Studies Employing Continent Valuation Methods

Common recommendations from CVM surveys are:

(1) An introductory section which helps set the general context for the decision to be made

(2) A detailed description of the good to be offered to the respondent

(3) The institutional setting in which the good will be provided

(4) The manner in which the good will be paid for

(5) A method by which the survey elicits the respondents preferences with respect to the good

(6) The collection of a set of respondent characteristics including attitudes, debriefing questions, and demographic information.

(Carson, Flores and Meade, 2001)

Appendix C – Descriptive Statistics

Descriptive Statistics

Gender	
Female	Male
88 57.14%	66 42.86%

Age					
13-17	18-24	25-34	35-54	55-64	65 or over
12	63	47	25	5	2
7.79%	40.91%	30.52%	16.23%	3.25%	1.30%

Country	Europe	99	64%	Netherlands	67	43.51%
				Sweden	11	7.14%
				Germany	7	4.54%
				Belgium	6	3.90%
				UK	4	2.60%
				Italy	1	.65%
				Greece	1	.65%
				Spain	1	.65%
				Romania	1	.65%
	International	55	36%	USA	42	27.27%
				Canada	1	.65%
				Nicaragua	1	.65%
				Israel	1	.65%
				Egypt	1	.65%
				United Arab Emirates	1	.65%
				Singapore	2	1.30%
				Hong Kong	1	.65%
				New Zealand	1	.65%
				Australia	4	2.60%

Employment							
Full-time Employment	Part-time Employment / internship	Self-employed	Working Student	Student	Retired	Unemployed	Other
48	12	14	24	44	2	5	5
31.16%	7.80%	9.09%	15.58%	28.57%	1.30%	3.25%	3.25%

Appendix D – Cross Tabulations

Table D1
Cross tabulation of respondents' WTP and WTL against Preferred Service Tier

WTP				WTL 1	2	3	4	5	6	Total
3	Preferred Service	Premium	N	6	0	1	1	1	1	10
			%	3.90	0.00	0.65	0.65	0.65	0.65	6.49
		Free	N	9	3	1	2	3	1	19
			%	5.84	1.95	0.65	1.30	1.95	0.65	12.34
	Total		N	15	3	2	3	4	2	29
			%	9.74	1.95	1.30	1.95	2.60	1.30	18.83
6	Preferred Service	Premium	N	3	3	9	2	1	2	20
			%	1.95	1.95	5.84	1.30	0.65	1.30	12.99
		Free	N	2	3	3	2	0	1	11
			%	1.30	1.95	1.95	1.30	0.00	0.65	7.14
	Total		N	5	6	12	4	1	3	31
			%	3.25	3.9	7.79	2.6	0.65	1.95	20.13
9	Preferred Service	Premium	N	9	4	2	5	3	1	24
			%	5.84	2.60	1.30	3.25	1.95	0.65	15.58
		Free	N	1	1	1	1	2	1	7
			%	0.65	0.65	0.65	0.65	1.30	0.65	4.55
	Total		N	10	5	3	6	5	2	31
			%	6.49	3.25	1.95	3.90	3.25	1.30	20.13
12	Preferred Service	Premium	N	14	3	6	7	3	6	39
			%	9.09	1.95	3.90	4.55	1.95	3.90	25.32
		Free	N	1	0	1	3	1	1	7
			%	0.65	0.00	0.65	1.95	0.65	0.65	4.55
	Total		N	15	3	7	10	4	7	46
			%	9.74	1.95	4.55	6.49	2.60	4.55	29.87
15	Preferred Service	Premium	N	2	0	0	3	2	4	11
			%	1.30	0.00	0.00	1.95	1.30	2.60	7.14
		Free	N	0	0	0	0	1	0	1
			%	0.00	0.00	0.00	0.00	0.65	0.00	0.65
	Total		N	2	0	0	3	3	4	12
			%	1.30	0.00	0.00	1.95	1.95	2.60	7.79
18	Preferred Service	Premium	N	0	0	1	1	0	0	2
			%	0.00	0.00	0.65	0.65	0.00	0.00	1.30
		Free	N	0	1	1	1	0	0	3
			%	0.00	0.65	0.65	0.65	0.00	0.00	1.95
	Total		N	0	1	2	2	0	0	5
			%	0.00	0.65	1.30	1.30	0.00	0.00	3.25

Total	Preferred Service	Premium	N	34	10	19	19	10	14	106
			%	22.08	6.49	12.34	12.34	6.49	9.09	68.83
		Free	N	13	8	7	9	7	4	48
			%	8.44	5.19	4.55	5.84	4.55	2.60	31.17
	Total		N	47	18	26	28	17	18	154
			%	30.52	11.69	16.88	18.18	11.04	11.69	100.00

Table D2

Cross tabulation of respondents' Time Spent Listening to MSS against Preferred Service Tier

		Preferred Service Tier		Total
Time spent listening to MSS		Premium Service Tier	Free Service Tier	
30 minutes or less	N	19	19	38
	%	12.34	12.34	24.68
Roughly 30 minutes to 1 hour	N	4	0	4
	%	2.6	0.00	2.60
Roughly 1 to 1.5 hours	N	17	7	24
	%	11.04	4.55	15.58
Roughly 1.5 to 2 hours	N	17	8	25
	%	11.04	5.19	16.23
Roughly 2 to 4 hours	N	17	2	19
	%	11.04	1.30	12.34
Roughly 4 to 6 hours	N	21	8	29
	%	13.64	5.19	18.83
Roughly 6 to 8 hours	N	10.00	3	13
	%	6.49	1.95	8.44
8 hours or more	N	1	1	2
	%	0.65	0.65	1.30
Sum	N	106	48	154
	%	68.83	31.17	100.00

Appendix E – Statistical Test Results

E1. Chi-Squared Test of Independence: Piracy against Preferred Service Tier

Cell Contents

Count
Expected Values
Chi-square contribution
Row Percent
Column Percent
Total Percent

Total Observations in Table: 154

Piracy	Preferred Service Tier		Row Total
	NewMSS (Prefer Premium)	NewMSS Basic (Prefer Free)	
No	82 78.468 0.159 71.930% 77.358% 53.247%	32 35.532 0.351 28.070% 66.667% 20.779%	114 74.026%
Yes	24 27.532 0.453 60.000% 22.642% 15.584%	16 12.468 1.001 40.000% 33.333% 10.390%	40 25.974%
Column Total	106 68.831%	48 31.169%	154

Statistics for All Table Factors

Pearson's Chi-squared test

Chi^2 = 1.964294 d.f. = 1 p = 0.1610548

Pearson's Chi-squared test with Yates' continuity correction

Chi^2 = 1.44758 d.f. = 1 p = 0.2289167

Minimum expected frequency: 12.46753

E2. Chi-Squared Test of Independence: Piracy against Low and High WTP

Cell Contents

Count
Expected Values
Chi-square contribution
Row Percent
Column Percent
Total Percent

Total Observations in Table: 154

Piracy	WTP		Row Total
	Low WTP	High WTP	
No	64 67.364 0.168 56.140% 70.330% 41.558%	50 46.636 0.243 43.860% 79.365% 32.468%	114 74.026%
Yes	27 23.636 0.479 67.500% 29.670% 17.532%	13 16.364 0.691 32.500% 20.635% 8.442%	40 25.974%
Column Total	91 59.091%	63 40.909%	154

Statistics for All Table Factors

Pearson's Chi-squared test

Chi^2 = 1.580642 d.f. = 1 p = 0.2086683

Pearson's Chi-squared test with Yates' continuity correction

Chi^2 = 1.145648 d.f. = 1 p = 0.2844621

Minimum expected frequency: 16.36364

E3. Chi-Squared Test of Independence: Piracy against Low and High Premium WTP

Cell Contents

Count
Expected Values
Chi-square contribution
Row Percent
Column Percent
Total Percent

Total Observations in Table: 106

Piracy	Premium WTP		
	Low Premium WTP	High Premium WTP	Row Total
No	38 41.774 0.341 46.341% 70.370% 35.849%	44 40.226 0.354 53.659% 84.615% 41.509%	82 77.358%
Yes	16 12.226 1.165 66.667% 29.630% 15.094%	8 11.774 1.209 33.333% 15.385% 7.547%	24 22.642%
Column Total	54 50.943%	52 49.057%	106

Statistics for All Table Factors

Pearson's Chi-squared test

Chi^2 = 3.069048 d.f. = 1 p = 0.0797962

Pearson's Chi-squared test with Yates' continuity correction

Chi^2 = 2.309631 d.f. = 1 p = 0.1285746

Minimum expected frequency: 11.77358

E4. Welch Two Sample t-test: Piracy against WTP

	Piracy	N	Mean	Std. Deviation	Median	Mad	Min	Max	Skew	Std. Error
WTP	0 No	114	8.97	4.16	9	4.45	3	18	0.06	0.39
	1 Yes	40	8.78	3.98	9	4.45	3	18	0.2	0.63

	Welch Two Sample t-test						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
						Lower	Upper
WTP	0.2683	70.922	0.7892	0.19	-0.24	-1.277912	1.675280

E5. Welch Two Sample t-test: Piracy against WTL

	Piracy	N	Mean	Std. Deviation	Median	Mad	Min	Max	Skew	Std. Error
WTL	0 No	114	3.04	1.76	3	2.97	1	6	0.21	0.17
	1 Yes	40	2.98	1.7	3	1.48	1	6	0.43	0.27

	Welch Two Sample t-test						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
						Lower	Upper
WTL	0.21814	70.407	0.828	0.06	-0.1	-0.5606686	0.6983879

E6. Chi-Squared Test of Independence: Piracy against Average Time Spent Listening to MSSs per Week

Cell Contents

Count
Expected Values
Chi-square contribution
Row Percent
Column Percent
Total Percent

Total Observations in Table: 154

Piracy	Average Time Spent Listening to MSSs per Week								Row Total
	3.5	7	10.5	14	28	42	56	84	
No	25	27	19	17	13	10	1	2	114
	28.130	21.468	18.506	17.766	14.065	9.623	1.481	2.961	
	0.348	1.426	0.013	0.033	0.081	0.015	0.156	0.312	
	21.930%	23.684%	16.667%	14.912%	11.404%	8.772%	0.877%	1.754%	74.026%
	65.789%	93.103%	76.000%	70.833%	68.421%	76.923%	50.000%	50.000%	
	16.234%	17.532%	12.338%	11.039%	8.442%	6.494%	0.649%	1.299%	
Yes	13	2	6	7	6	3	1	2	40
	9.870	7.532	6.494	6.234	4.935	3.377	0.519	1.039	
	0.992	4.064	0.038	0.094	0.230	0.042	0.444	0.889	
	32.500%	5.000%	15.000%	17.500%	15.000%	7.500%	2.500%	5.000%	25.974%
	34.211%	6.897%	24.000%	29.167%	31.579%	23.077%	50.000%	50.000%	
	8.442%	1.299%	3.896%	4.545%	3.896%	1.948%	0.649%	1.299%	
Column Total	38	29	25	24	19	13	2	4	154
	24.675%	18.831%	16.234%	15.584%	12.338%	8.442%	1.299%	2.597%	

Statistics for All Table Factors

Pearson's Chi-squared test

Chi^2 = 9.176429 d.f. = 7 p = 0.2402362

Minimum expected frequency: 0.5194805

Cells with Expected Frequency < 5: 6 of 16 (37.5%)

Appendix F – Figures

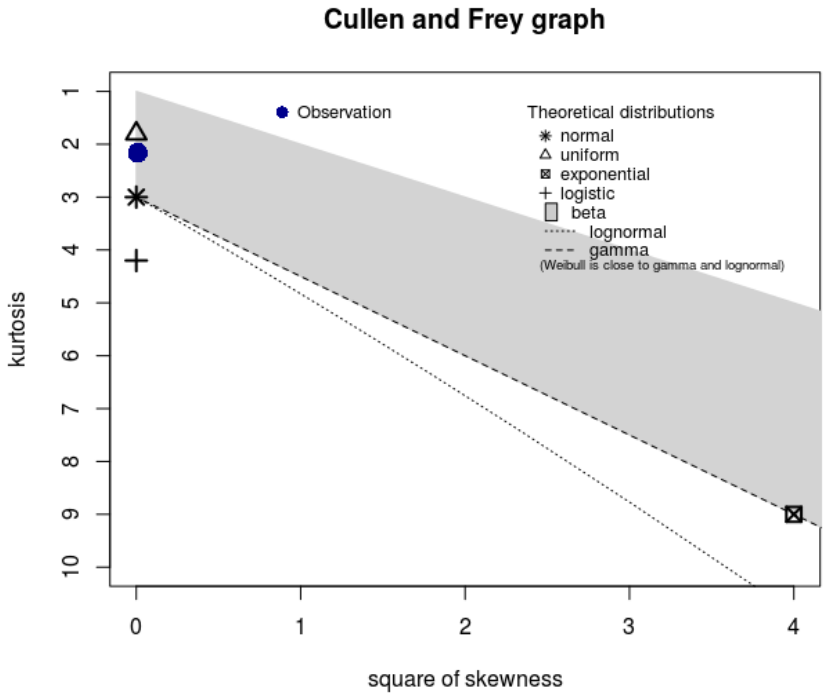

Figure F1. Cullen and Frey graph of WTP variable

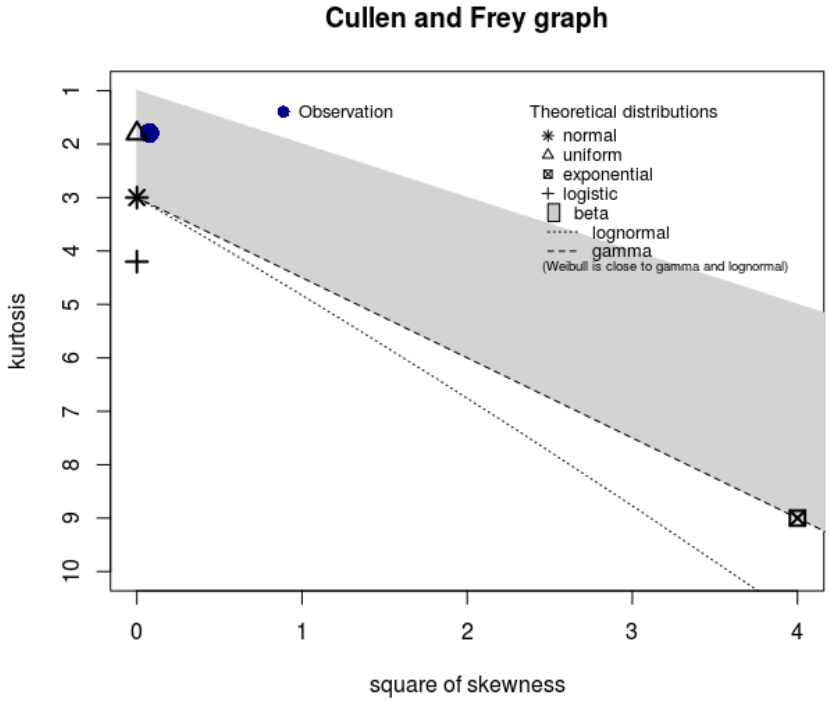

Figure F2. Cullen and Frey graph of WTL variable

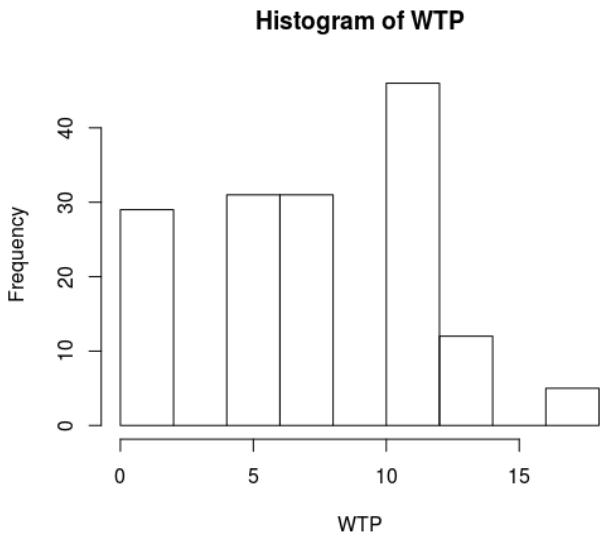

Figure F3. Histogram of WTP variable

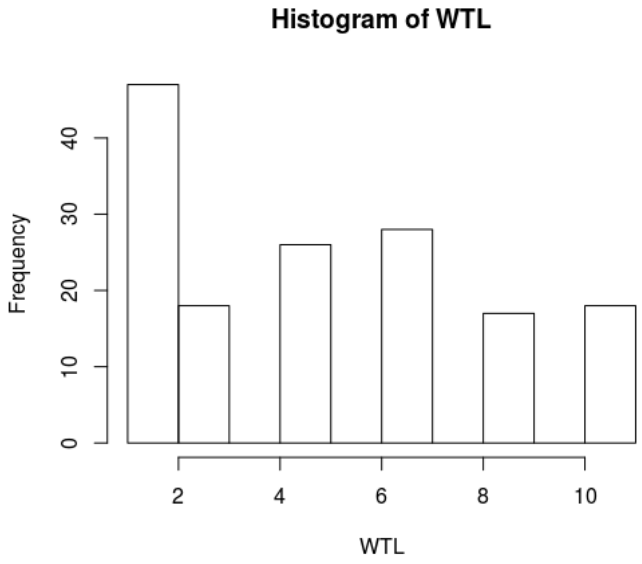

Figure F4. Histogram of WTL variable

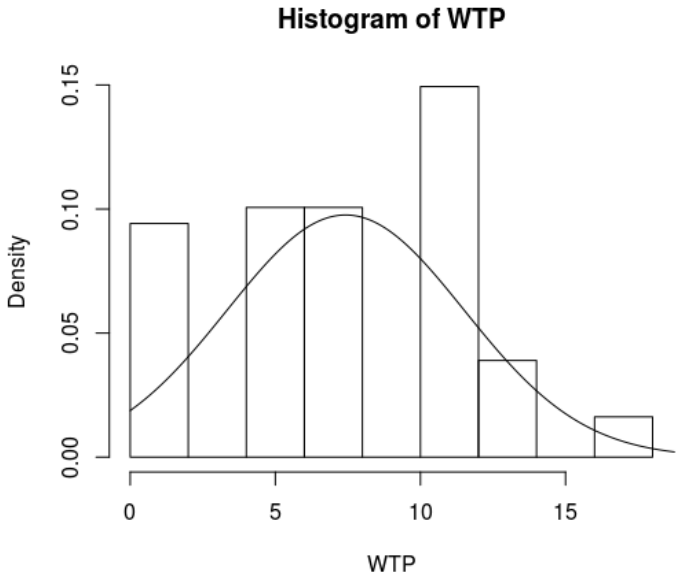

Figure F5. Normal distribution fitted over WTP variable

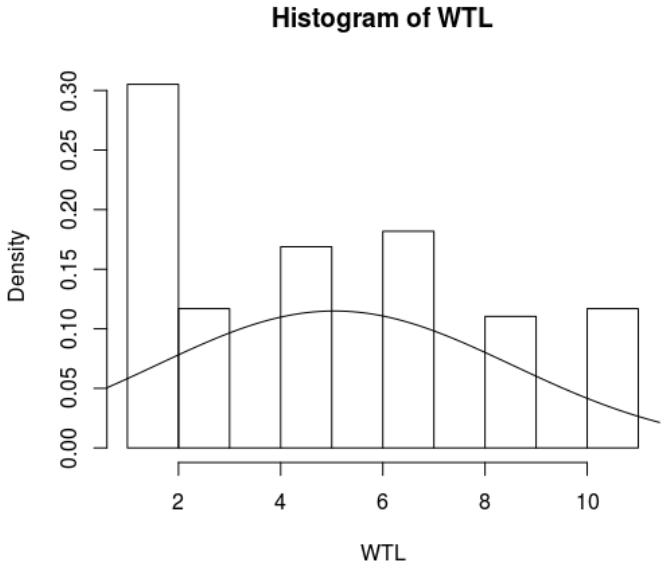

Figure F6. Normal distribution fitted over WTL variable

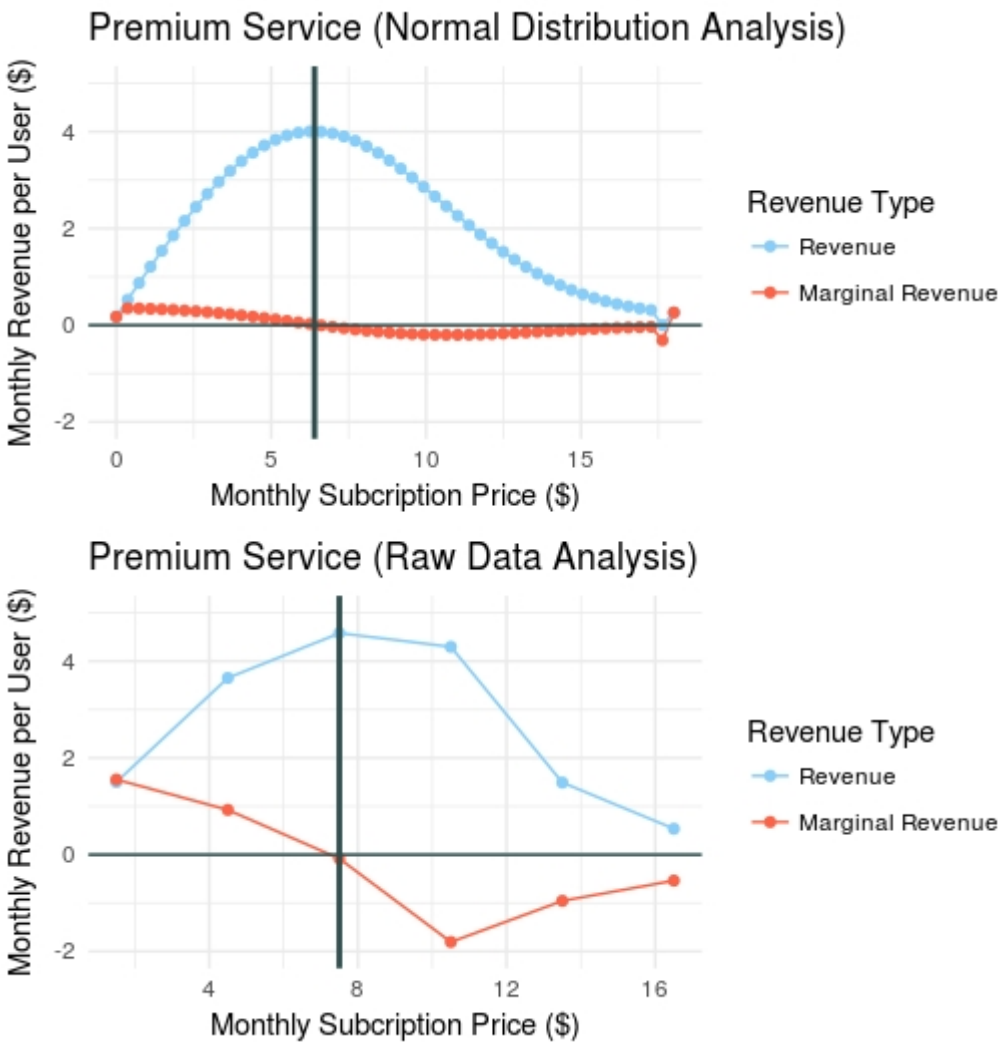

Figure F7. Marginal Revenues for Premium Service Configuration

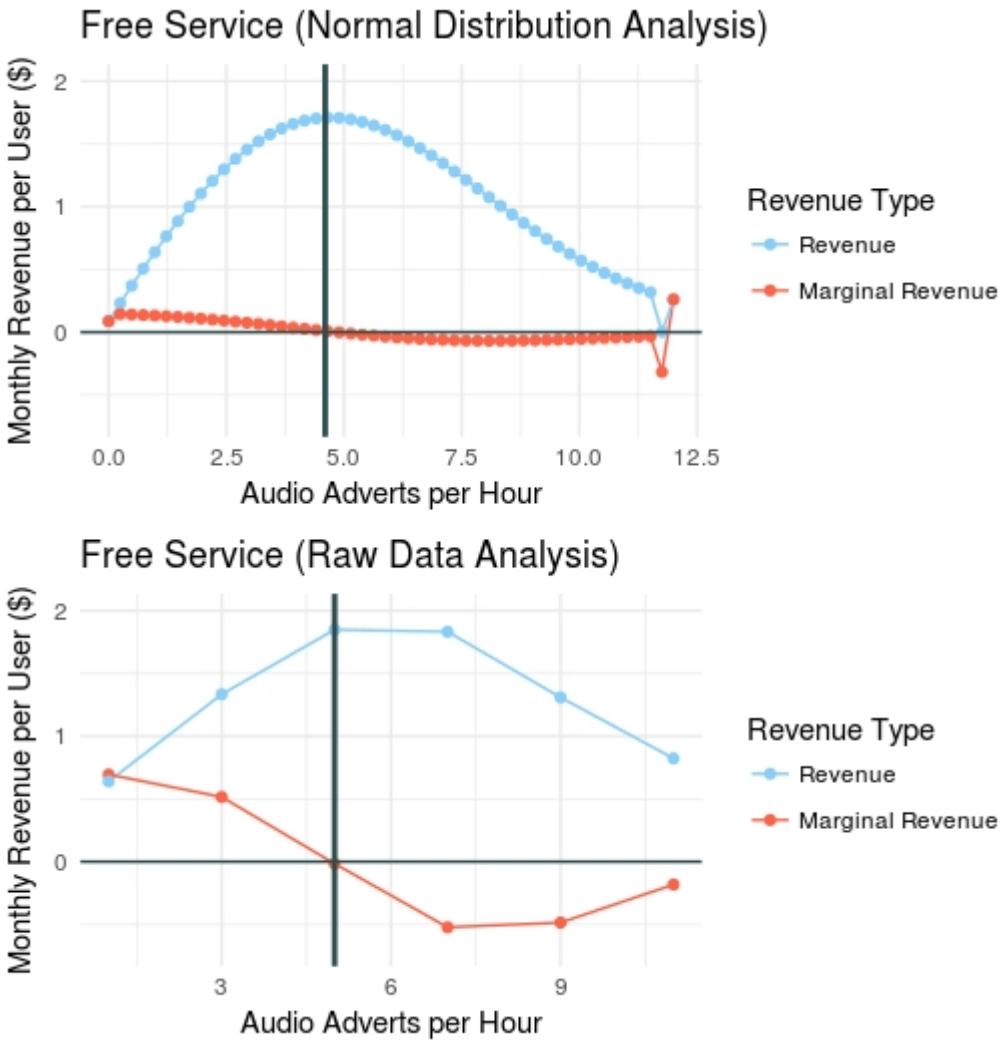

Figure F8. Marginal Revenues for Free Service Configuration

Appendix G – Questionnaire

Questionnaire

Introduction

What is your gender?
Male
Female

What is your current country of residency?

What is your age?
Under 13
13-17
18-25
26-34
35-54
55-64
65 or over

What is your current employment status?
Unemployed
Student
Working student
Part-time employment or internship
Full-time employment
Self-employed
Retired
Other

Which of the following music streaming services do you use?
Apple Music
Deezer
Google Play Music
Pandora One
Spotify
Tidal
Other (please specify)

Do you pay to use your music streaming service?
Yes
No, never have
No, but I have done so in the past
No, but I plan to do so in the future

On average, how much time do you spend listening to music on your music streaming service per day?
10 minutes or less
around 30 minutes
around 1 hour
around 1.5 hours
around 2 hours
around 4 hours
around 8 hours

around 10 hours or more
Aside from streaming, how else do you listen to music? (Please fill in all the options that apply)
Offline mediums (CD's, Tapes, Vinyl)
Radio
Online digital media stores (iTunes Store)
Video streaming sites (YouTube, Vimeo)
Informal/ unlicensed online sources (Pirate bay, Filezilla)

Only use streaming services/platforms
Other (please specify)

Premium Tier

You are offered a new music streaming service (NewMSS) which has the following attributes and features;
Offline playback
Accessible over multiple devices (mobile, computer, video game console)
Accessible over multiple mobile/ desktop platforms
Personalized playlists
No advertisements
Social media/community features (share playlists, "see what friends are listening too" feature)
High music playback quality (320kbit/s)
Large music catalog (30 million+)
Please take into consideration the listed features and attributes of NewMSS above when answering the following questions.
Since NewMSS does not host advertisments, it depends on paid subscribtion to maintain its service. The aim of the following set of questions is to roughly estimate the price you are willing to pay in euros (€) per month, to subscribe to NewMSS.

Bid 9: Would you be willing to pay 9 (€/$) per month to use NewMSS?
Yes
No
Bid 12: Would you be willing to pay 12 (€/$) per month to use NewMSS?
Yes
No
Bid 15: Would you be willing to pay 15(€/$) per month to use NewMSS?
Yes
No
Bid 6: Would you be willing to pay 6(€/$) per month to use NewMSS?
Yes
No
Bid 3: Would you be willing to pay 3(€/$) per month to use NewMSS?
Yes
No
Premium why: Why are you willing to pay the price(s) you indicated, in the previous questions, to subscribe to NewMSS?
You believe it is a fair price given the ease of use and access to music
You believe it is a fair price given the quality and amount of available music
You believe it is a fair price given there are no advertisements
Other (please specify)

Free Tier

NewMSS has launched it's basic version (NewMSS Basic) with the following attributes and features;

Online playback only

Restricted access on mobile/desktop platforms
Restricted access on devices (mobile and computer only)
No on-demand playback possibilities on mobile application (playback in shuffle mode only)
Audio advertisements
Social media/community features (share playlists, “see what friends are listening too” feature)
Low music playback quality (128kbit/s)
Average size music catalog (20 million +)

Please take into consideration the listed features and attributes of NewMSS Basic when answering the following questions.

Since users do not pay to use NewMSS Basic, it depends on advertisement revenue to maintain its service. The aim of the following set of questions is to roughly estimate the amount of minutes you are willing to listen to audio advertisements (ads) per hour in order to use NewMSS Basic. The total ad minutes will be divided into 30 second increments and spread evenly across every hour.

Adtime bid 3: Would you be willing to listen to a total of 3 minutes of advertisements within an hour to use NewMSS Basic?
Yes
No

Adtime bid 4: Would you be willing to listen to a total of 4 minutes of advertisements within an hour to use NewMSS Basic?
Yes
No

Adtime bid 5: Would you be willing to listen to a total of 5 minutes of advertisements within an hour to use NewMSS Basic?
Yes
No

Adtime bid 2: Would you be willing to listen to a total of 2 minutes of advertisements within an hour to use NewMSS Basic?
Yes
No

Adtime bid 1: Would you be willing to listen to a total of 1 minutes of advertisements within an hour to use NewMSS Basic?
Yes
No

Free Why: Why are you willing to listen to the amount of advertisements you indicated, in the previous questions, in order to use NewMSS Basic?

You believe it is a suitable amount given the attributes and features of NewMSS Basic
You believe it is a suitable amount to compensate for free use of NewMSS Basic
You are not bothered by advertisements
Other (please specify)

Preferred Tier

Imagine you had to choose between NewMSS and NewMSS Basic.
NewMSS is offered at the price you are willing to pay, and NewMSS Basic is offered with the amount of advertisement time you are willing to listen too.
Out of the two, which would you prefer?

NewMSS
NewMSS Basic

Why NewMSS: **Why do you prefer NewMSS? (Please fill in all the options that apply)**

- Because of the premium features offered by NewMSS (offline playback, on demand streaming, ect...)
- Because you do not want to hear any advertisements
- Because NewMSS provides quick and easy access to new music
- Because you want to support your favorite artists by paying to subscribe
- Other (please specify)

Why NewMSS Basic: **Why do you prefer NewMSS Basic? (Please fill in all the options that apply)**

- Because you are unwilling to pay for the premium features offered by NewMSS (offline playback, on demand streaming, ect...)
- Because you are unable to pay for NewMSS
- Because you are dissatisfied with the monthly payment schedule of NewMSS
- Because you are not bothered by advertisements
- Other (please specify)

Appendix H – R-Code

R-Code for Normal Distribution Analysis

```
library(DescTools)
library(fitdistrplus)
library(fields)

# command for uploading the data set
mydata <- read.csv("/home/rebecca/Documents/Education/1. Erasmus CEE/Master's
Thesis/R stuff/Data/data1.csv")

# Change to FALSE to see what would happen if you only use premium or only use free
# Keep in mind that the actual revenue is then revenue[optimum, gridsize] or
revenue[gridsize, optimum]
# If you want to see what happens when you have both, use TRUE
include_negative = FALSE

mydata$WTP->MaxPrice
mydata$WTL->MaxTime
mean(mydata$TimePerWeek)->TimePerWeek
ProbPrefMoney = 0.68

# Group per 3eu/1min
price_width = 3
time_width = 1

# Correct for bias (takeing the "middel" into account, since we are rounding up)
MaxPrice = MaxPrice - 0.5 * price_width
MaxTime = MaxTime - 0.5 * time_width

#Transforming ad time into amount. (Since ads on MSSs last for 30 seconds
# each interval of 0.5 will equate to 1 advertisment)
MaxTime = MaxTime / 0.5

# Make some plots
hist(MaxPrice)
hist(MaxTime)

# Fit a distribution to our data
pricefit = fitdist(MaxPrice, "norm")
timefit = fitdist(MaxTime, "norm")

# Extract the mean and SD automatically
pricefit_mean = pricefit$estimate[1]
```

```
pricefit_sd = pricefit$estimate[2]
timefit_mean = timefit$estimate[1]
timefit_sd = timefit$estimate[2]

x   <- seq(0,20,length=1000)
y   <- dnorm(x,mean=pricefit_mean, sd=pricefit_sd)
hist(MaxPrice, freq=FALSE)
lines(x,y, type="l", lwd=1)

x   <- seq(-10,20,length=1000)
y   <- dnorm(x,mean=timefit_mean, sd=timefit_sd)
hist(MaxTime, freq=FALSE)
lines(x,y, type="l", lwd=1)

# Finally, do the optimization
# Want to find the price for which revenue is the highest

# Set up some variables
value_ad =  0.01 # I found that spotify has a average CPM rate of 10.00 euros which is
0.01 euros for 1 audio ad of 30 seconds
hours_per_month = TimePerWeek * 4
prob_prefer_money = ProbPrefMoney
no_users = 1 # actually pretty arbitrary, now I find the revenue per person

combine = value_ad * hours_per_month

# Make a discrete grid
gridsize = 100 # EDITABLE, to make the graphs prettier but take longer

grid_price <- seq(0,20,length=gridsize) # optimum price is between 0 an 20 I assume
grid_time <- seq(0,10,length=gridsize) # optimum adtime per hour is between 0 and 10 I
assume
revenue = array(0, dim=c(gridsize,gridsize))

# Define how the revenue is calculated
find_revenue <- function(pr, ad, pricefit, timefit, prefermoney, combine,
include_negative) {
  fraction_wtp = pnorm(pr, pricefit$estimate[1], pricefit$estimate[2],lower.tail=FALSE)
  fraction_wtl = pnorm(ad, timefit$estimate[1], timefit$estimate[2],lower.tail=FALSE)

  result_positive_pr = pr * fraction_wtp
  result_positive_ad = ad * combine * fraction_wtl
  result_positive = result_positive_pr + result_positive_ad
  if (include_negative == FALSE) {
    result_negative = 0
  } else {
```

```
    result_negative_pr = result_positive_pr * pnorm(ad, timefit$estimate[1],
timefit$estimate[2],lower.tail=FALSE) * (1-prefermoney)
    result_negative_ad = result_positive_pr * pnorm(pr, pricefit$estimate[1],
pricefit$estimate[2],lower.tail=FALSE) * prefermoney
    result_negative = result_negative_pr + result_negative_ad
  }
  result = result_positive - result_negative
  return(result)
}

# Loop over the grid
for (pr in seq(0,gridsize,length=gridsize)){
  for (ad in seq(0,gridsize,length=gridsize)){
    revenue[pr, ad] = find_revenue(grid_price[pr], grid_time[ad], pricefit, timefit,
prob_prefer_money, combine, include_negative)
  }
}

# Find the optimal price
# Row is price, col is adtime
temp = which(revenue == max(revenue), arr.ind = TRUE)

# Make a plot!
if (include_negative) {
  grid_time[temp[1]]
  grid_price[temp[2]]
  image.plot(grid_price, grid_time, revenue)
} else {
  # These are the maximum revenues per person if I only have premium or free
  # Free:
  grid_time[temp[1]]
  revenue[gridsize,temp[2]]
  # Premium:
  grid_price[temp[2]]
  revenue[temp[1],gridsize]
  plot(grid_time, revenue[gridsize,])
  plot(grid_price, revenue[,gridsize])
}
# Change the variable include_negative at the very top to FALSE to see freemium
```

Appendix I – References

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