



CIRANO

Allier savoir et décision

The Three-Legged Stool of Value of Copyrighted Music: Hertzian Radio, SiriusXM, and Spotify (The Working Paper Version – v2)

MARCEL BOYER

2018S-32
WORKING PAPER



2018s-32

**The Three-Legged Stool of Value of Copyrighted Music:
Hertzian Radio, SiriusXM, and Spotify
(The Working Paper Version – v2)**

Marcel Boyer

Série Scientifique
Scientific Series

Montréal
Octobre/October 2018

© 2018 Marcel Boyer. Tous droits réservés. *All rights reserved.* Reproduction partielle permise avec citation du document source, incluant la notice ©. *Short sections may be quoted without explicit permission, if full credit, including © notice, is given to the source.*



Centre interuniversitaire de recherche en analyse des organisations

CIRANO

Le CIRANO est un organisme sans but lucratif constitué en vertu de la Loi des compagnies du Québec. Le financement de son infrastructure et de ses activités de recherche provient des cotisations de ses organisations-membres, d'une subvention d'infrastructure du gouvernement du Québec, de même que des subventions et mandats obtenus par ses équipes de recherche.

CIRANO is a private non-profit organization incorporated under the Quebec Companies Act. Its infrastructure and research activities are funded through fees paid by member organizations, an infrastructure grant from the government of Quebec, and grants and research mandates obtained by its research teams.

Les partenaires du CIRANO

Partenaires corporatifs

Autorité des marchés financiers
Banque de développement du Canada
Banque du Canada
Banque Laurentienne du Canada
Banque Nationale du Canada
Bell Canada
BMO Groupe financier
Caisse de dépôt et placement du Québec
Énergir
Hydro-Québec
Innovation, Sciences et Développement économique Canada
Intact Corporation Financière
Investissements PSP
Ministère de l'Économie, de la Science et de l'Innovation
Ministère des Finances du Québec
Mouvement Desjardins
Power Corporation du Canada
Rio Tinto
Ville de Montréal

Partenaires universitaires

École de technologie supérieure
HEC Montréal
Institut national de la recherche scientifique
Polytechnique Montréal
Université Concordia
Université de Montréal
Université de Sherbrooke
Université du Québec
Université du Québec à Montréal
Université Laval
Université McGill

Le CIRANO collabore avec de nombreux centres et chaires de recherche universitaires dont on peut consulter la liste sur son site web.

Les cahiers de la série scientifique (CS) visent à rendre accessibles des résultats de recherche effectuée au CIRANO afin de susciter échanges et commentaires. Ces cahiers sont écrits dans le style des publications scientifiques. Les idées et les opinions émises sont sous l'unique responsabilité des auteurs et ne représentent pas nécessairement les positions du CIRANO ou de ses partenaires.

This paper presents research carried out at CIRANO and aims at encouraging discussion and comment. The observations and viewpoints expressed are the sole responsibility of the authors. They do not necessarily represent positions of CIRANO or its partners.

ISSN 2292-0838 (en ligne)

The Three-Legged Stool of Value of Copyrighted Music: Hertzian Radio, SiriusXM, and Spotify (The Working Paper Version – v2)*

Marcel Boyer[†]

Acknowledgments: I would like to thank the numerous economists and lawyers from academia, copyright collectives, law firms, and private and public organizations and corporations, on all sides of the copyright debates, sometimes highly charged, in particular before the Copyright Board of Canada, with whom I had the chance to discuss, over the last twenty years, the issues covered in this paper. They are too numerous to list here. I would like to thank in particular David R. Strickler, U.S. Copyright Royalty Judge (Economics), who provided very useful comments on recent drafts of this paper. Judge Strickler's comments were based on his personal review and were not made as a representative of the U.S. Copyright Royalty Board. His comments were not offered to support, endorse or contradict – or advocate for or against – the substance or appropriateness of the ideas expressed in this paper. I would like to acknowledge the Toulouse School of Economics Jean-Jacques Laffont Center on the Digital Economy for its support. However, I remain solely responsible for the content of this paper, in particular of its shortcomings.

Abstract

Pricing copyrighted works or assets has always been a difficult task given the information good character of such works. Doing it in the digital era is even more challenging. This paper proposes an approach to infer the competitive market value of copyrights in music from choices made by users namely the operators of Hertzian radio (HR), satellite radio (SiriusXM), and interactive music streaming services (Spotify). The inferred competitive values, which are obtained independently, fall in the same ballpark, although they need not be equal or even close as business models and cost structures differ significantly between those music delivery technologies. Nevertheless the estimated competitive market values of music copyrights clearly indicate that rightsholders are significantly shortchanged and poorly served by the current copyright pricing framework. Appendix A presents the data from which one can infer the value of music in HR. Appendix B presents an overview of the debate before the Copyright Board of Canada following the presentation of the model from which the value of music in HR can be inferred.

Keywords: Copyright, Royalty rates, Hertzian radio, Satellite radio, SiriusXM, Online Music Services, Spotify

JEL Codes: H41, L38, L51, O34

* This is a significantly revised version of CIRANO 2017s-16. A shorter version appeared under the same title, pp. 13-40 in Ysolde Gendreau (ed.), *Le Droit d'Auteur en Action : Perspectives Internationales sur les Recours / Copyright in Action: International Perspectives on Remedies / El Derecho de Autor en Acción: Perspectivas Internationales sobre los Medios de Protección*, Proceedings of the 2018 World Congress of ALAI (Alliance littéraire et artistique internationale), Éditions Thémis, Montréal 2019, 490 pages.

[†] Marcel Boyer Ph.D., O.C., FRSC
Emeritus Professor of Economics, Université de Montréal
Associate Member, Toulouse School of Economics
Fellow, CIRANO

Résumé

La tarification des œuvres ou actifs protégées par le droit d'auteur a toujours été une tâche difficile étant donné le caractère 'biens d'information' de ces œuvres. Le faire à l'ère du numérique est encore plus difficile. Ce cahier propose d'inférer la valeur de marché à partir du comportement et des choix des utilisateurs, principalement les opérateurs de radio Hertzienne, de radio par satellite (SiriusXM) et de services de musique en ligne (Spotify). Les valeurs ainsi inférées séparément sont de niveaux comparables bien qu'il ne soit pas nécessaire qu'il en soit ainsi étant donné les différences importantes entre leurs modèles d'affaire et leurs structures de coûts. Les valeurs estimées montrent clairement que les ayants-droits sont significativement sous-compensés et donc mal servis par le système actuel de tarification des droits d'auteur. Deux appendices sur les données et le modèle utilisés pour inférer la valeur de la musique dans la radio commerciale au Canada complètent le cahier.

Mots-clés: Droits d'auteur, Royautés, Radio Hertzienne, SiriusXM, Services de musique en ligne, Spotify

Introduction

The advent of the digital era raises significant challenges for the music industry. Determining the competitive market value or values of music copyrights lies at the core of those challenges. It represents the most important question the copyright industries are facing today. This article develops an approach to the determination of the competitive market value of music copyrights that is not based on path-dependent historical heuristics or value judgements. Hence, its contribution.

Three principles rule the copyright pricing challenge. First, the competitive level playing field principle, which states that all uses of musical works and sound recordings, whether in hard or digital form, should compete for customers on equal terms, given the various business models of users or distributors: same pricing for similar uses, different but compatible pricing for different uses. Second, the competitive market value principle or the willing buyer willing seller principle, which states that the compensation of rightsholders should achieve efficiency and effectiveness, hence fairness for both users and rightsholders. Third, the information good pricing principle, which states that users should have access to, if not consume, virtually all available musical works, given that those musical works are permanent, that is, not destroyed in consumption. Information goods are public goods in the economic sense, but with a particular cost structure, namely a relatively high cost of the first copy and low if not zero marginal cost of additional copies through reproduction and dissemination.

The competitive pricing of copyrights in such a context aims to achieve balance between rightsholders' rights and users' rights through the *proper* compensation of creators for the valuable assets they create, the *proper* compensation of business users for the costs and risks they incur, and the *proper* if not maximal dissemination of musical creations, as consumers' rights. Achieving such competitive pricing requires to move away from traditional heuristics toward sounder analytics. Although they dominate the royalty rate setting approaches used today in different institutional contexts, the historical or path-dependent heuristics are of little help in guiding the search for value.

The current procedures for determining royalties are based mainly on path-dependent heuristics and rules of thumb whose foundations in theoretical and applied economics are relatively weak and clearly inadequate to tackle the challenges of pricing music copyright.

The two fundamental questions before us are the following: First, what is or are the competitive market value or values of copyright given the “information good” aspect of copyrighted works (music and books), and the advent of digitization, which makes the emergence of properly functioning competitive markets difficult, even impossible? Second, how to balance the creators' right to a fair (competitive) compensation and the users' right to the benefits of digital technologies, at a time when digitization brings down the cost of dissemination to almost zero and in so doing makes the conflict between users' and rightsholders' rights more acute than ever before?

Indeed, digitization favors a convergence of prices towards zero (marginal cost of distribution), a Bertrand trap, thereby making it difficult if not impossible to cover the fixed cost of creation. Before the advent of digitization, the significant cost of dissemination could allow rightsholders to capture a surplus capable of covering the fixed cost of creation.¹

This calls for a significant reassessment of both the way we understand and enforce copyright protection and the channels through which market principles could determine and achieve creators' competitive compensation levels. This is at best a difficult multifaceted endeavour, whose solution lies clearly outside the box.

The market for musical works and sound recordings

As the debate on the re-examination of copyright legal foundations and enforcement, coverage, exceptions, and compensation takes place, the market or markets of music delivery are changing rapidly.

Since musical works and sound recordings are information goods or assets, the determination of relevant prices or tariffs rests not so much on the cost of creation, which is underlying the supply function of new works and new sound recordings, but rather on the value of such goods for the users.² We thus need a rigorous basis for ascertaining the competitive market usage value of copyrighted works or assets.

To set the table, let us consider some statistics on the music industry. According to Nielsen Music360 Report (2015),³ Americans streamed 135 billion tracks in the first half of 2015, an increase of more than 90% from the first half of 2014. However, only 9% of them expect or are likely to subscribe or pay for streaming music in the next 6 months. One may wonder why the vast majority of people are thus refusing to put their hand in their pocket to have access to (almost) all the music in the world.⁴ It is interesting to note that although online streaming is increasing rapidly, about 60% of respondents say they rely on radio, Hertzian or satellite, to find out about new music.

In a Phoenix Center Report released in March 2017, Beard and al. claim that: "In 1999, the year the Digital Millennium Copyright Act ("DMCA") was enacted, revenues for the recording industry in the United States reached nearly \$21 billion (in current dollars), growing nearly 5% annually over the preceding decade. The future looked bright. Fifteen years later,

¹ The standard answer to such a problem is Ramsey pricing, based on price elasticities. However, in the current context, primary users are music using and distribution firms who could easily circumvent differential Ramsey prices. Indeed, oligopolistic competitors would most likely attempt to undercut a competitor's Ramsey prices, thereby falling again in a Bertrand trap.

² The Canadian Copyright Board recognized, in its 2002 Pay Audio Decision, that: "in information industries, pricing tends to be based on the value to the buyer, not on cost to produce."

³ <http://www.nielsen.com/us/en/insights/reports/2015/music-360-2015-highlights.html>

⁴ Spotify, the leading interactive streaming service, has over 30 million pieces of music in its repertoire. SoundCloud claims a repertoire of 125 million songs

due in large part to digital piracy made possible by technology and high-speed Internet connections, sales were only \$7 billion, a decline of 65% in real terms.”

According to Freidlander (2016), “Although our 2016 revenue report catalogues substantial overall improvement for the industry, revenues [7.7 billion US \$] are still only about half what they were in 1999, and revenues from more traditional unit-based sales (physical products and digital downloads) continued to decline significantly ... [The] streaming music platforms generated the majority [51%, with Digital Downloads and Ringtones 24.1% and Physical sales 21.8%] of the U.S. music industry’s revenues. The streaming category includes revenues from subscription services (such as paid versions of Spotify, TIDAL, and Apple Music), streaming radio services including those revenues distributed by SoundExchange (like Pandora, SiriusXM, and other Internet radio), and ad-supported on-demand streaming services (such as YouTube, Vevo, and ad-supported Spotify) ... In 2016, revenues from sales of digital tracks and albums declined faster than in any previous year. Overall digital download revenues were \$1.8 billion, down 22% versus 2015. Individual track sales revenue was down 24%, and digital album revenue was down 20% compared with the previous year. Revenues from sales of digital albums were 49% of the download total, their highest share ever ... The industry showed another increase, albeit from levels that remain well below their peak in the late 1990’s. The growth of streaming music and prevalence of digital platforms show that music consumption is higher than ever – which is great for fans. But challenges remain significant as physical shipments and digital downloads, two of the industry’s three major revenue sources, continued to decline in 2016. A similar evolution is observed in other countries.

However, U.S. radio listening hours in 2016 is still accounted for mostly by traditional radio, Hertzian (79%) and Satellite (8%), while webcaster Pandora is coming at 10%. Regarding U.S. music streaming hours, Pandora leads with 55% followed by Spotify at 32%.⁵ On a worldwide scale, Pandora and Spotify appear neck to neck. As a whole, music represents 79% of audio listening time.⁶ And 61% of Americans say that they discover music through radio (AM/FM and Satellite) compared to 27% for online audio or video streaming websites/apps.⁷

Interlocking financial arrangements are also developing. Major music labels appear to be holding minority stockholder positions in Spotify, namely Sony BMG (5.8%), Universal Music (4.8%), Warner Music (3.8%), and Merlin.⁸ Moreover, according to Roettgers (2017), SiriusXM invested US\$ 480 million for a 19% stake in Pandora and obtained three seats on its board of directors. Those are the most recent among other cross ownership deals that existed in the recent past and exist today.

⁵ Pandora Analyst Day, October 25 2016.

⁶ Edison Research (2016). Besides music at 79%, we find news at 9%, talk/personalities at 9%, and sports at 3%.

⁷ Nielsen Music (2015).

⁸ As reported by Swedish Wire, July 4 2017.

Those financial deals in a sense blur the lines in the music delivery industry. It is not clear how they will impact the intensity of competition among the different technologies and business models as well as the copyright royalties. But clearly, the above statistics show that the music industry is deeply affected by the age of digital technologies. And one thing is clear: unless rightsholders remain on their toes and avoid the risky position of being residual claimants in the development of the digital age, they will end up on the losing side of history.

The outline

The remainder of this article is organized as follows. In the next three sections, I develop three propositions characterizing the competitive value of music on three music delivery platforms namely Hertzian radio, Satellite radio, and interactive music streaming services Online Music Services. In each case, the value of music is inferred from rational profit maximizing principles that arguably underlie the choices made by the users as operators of the platforms. I then compare in Section 4 the competitive value measures and show that they fall in the same ballpark. I then conclude. Two Appendices complete the paper. The first one provides the data from the 2004 Canadian commercial Hertzian radio hearings as used by Audley and Boyer (2007) to derive the competitive market value of music copyrights in HR. The second one provides a critical assessment of the Copyright Board reasoning in its 2005/2008 decisions on the basis of the model proposed by Globerman (2007) on behalf of the Canadian Association of Broadcasters.

Section 1. The Search for Value: Hertzian Radio

The terrestrial (Hertzian) radio industry has many characteristics that make it suitable to derive an objective market-based value of music. It is a mature industry with good business data that one can analyze without making too many restrictive a priori assumptions. Indeed, we will see that the available data, potentially obtained under court order, allow us to derive the competitive market value of music in Hertzian radio (HR).⁹

We can assume that the objective of a commercial Hertzian radio broadcaster is to maximize profits or station value by capturing a particular niche audience to be sold to interested advertisers. The broadcaster achieves this by offering a combination of music and talk (hosts, DJs, and other on-air personalities) of a particular genre that is of interest to the sought-after niche audience.¹⁰ The broadcaster's crucial decisions are then what genre of music and talk to broadcast and how to split the program time between music M and talk T , given the choices made by competitors (in a Nash equilibrium).

For profits to be maximized, it must be the case that at the margin, the last minute of talk and the last minute of music brings the same net advertising revenue, that is, have the same

⁹ We consider here music-format radio stations defined as stations that broadcast music more than 20% of program time.

¹⁰ Talk represents more rigorously the non-music content of programming time. Elements excluded from program time are news, advertising, and station identification for instance.

marginal contribution to profit or station value; otherwise, the operator would change the program mix to reach a higher level of profits. Let (M^*, T^*) be the observed program time split, expressed in minutes or percentages of available program time, as chosen by the profit maximizing operator. The observed choice reveals an *implicit* competitive market price per minute, the same for both music M and talk T : if this price per minute use of music and talk were in effect, the broadcaster would choose the program mix (M^*, T^*) .

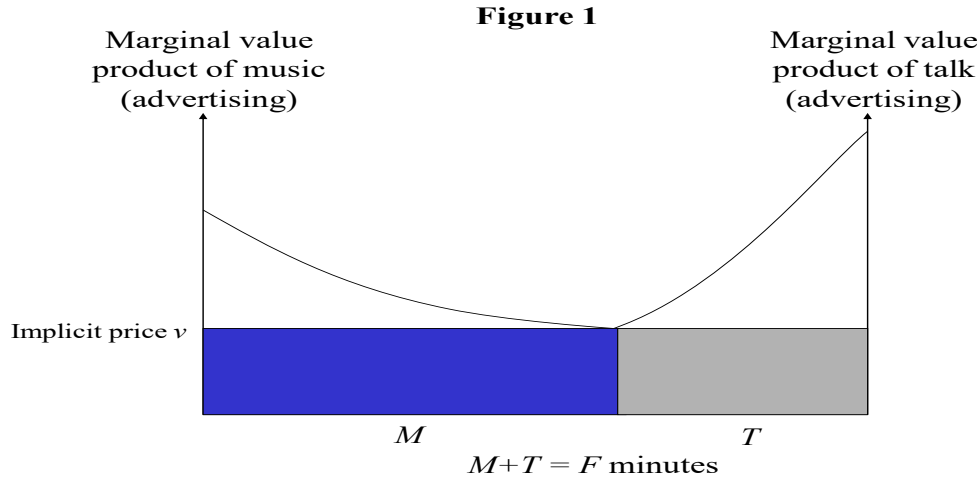
The following Figure 1¹¹ illustrates the model and results. Given an available F minutes of program content, the marginal value product (*mvp*) of music content, measured in minutes from left to right, is decreasing as music use increases and the marginal value product of talk content, measured in minutes from right to left, is also decreasing as talk content increases. The profit maximizing program time allocation is reached at the intersecting point where $mvp(M) = mvp(T)$, with $M+T = F$. The last minute of each type of content generates the same net marginal advertising revenue.

The competitive price of music content and talk content corresponds to the marginal, not the total, contribution of each to advertising revenues: the equal marginal contribution at the intersection of the two *mvp* curves is the *implicit* competitive per-minute market price of both music and talk. Indeed, the opportunity cost of an additional minute of music (or talk) is the lost revenue due to the forgone minute of talk (or music).¹² If confronted with that single and common per-minute price of music and talk, the profit maximizing radio operator would choose the amount of music M and the amount of talk T which equate their respective marginal value product to this common implicit price.

The competitive payments for music and talk, based on their common marginal contribution, are proportional to their respective program time. Those payments appear as the dark-shaded rectangle and the light-shaded rectangle in Figure 1. This proportionality is neither an assumption nor an opinion of outside analysts or experts, technologists, lawyers, judges, or economists, but a direct implication of the profit maximizing choices of the radio operators themselves.

¹¹ See Audley and Boyer (2007) and Boyer (2015).

¹² Such an opportunity cost approach may also allow an extension of the above analysis across delivery platforms. In the recent SDARS III (December 2017) decision by the US Copyright Royalty Board, the royalty rate was set by reference to the opportunity cost to record companies of playing music on SiriusXM. One reads: “the growth of Sirius XM’s profits allows it to compensate the record companies for the opportunity costs the latter incur when licensing to Sirius XM. (page 81). In Web IV decision of December 2015, one reads: “the threat of steering has been demonstrated by a *combination* of benchmarks, experiments and expert economic theorizing using fundamental principles of profit maximization and opportunity cost. This combination of proofs and arguments is actually *more persuasive* to the Judges than a mere benchmark standing alone” (page 118).



It is important to stress again at this point that the (M, T) allocation is chosen by the radio operator on the basis of his/her knowledge of the $mvp(M)$ and $mvp(T)$ curves. The outside observers, such as economists, lawyers or judges, can observe the (M, T) allocation but not the curves themselves. Although one can affirm that the chosen (M, T) allocation must be profit maximizing, one cannot say how much music and talk do in fact contribute to the station's revenues either absolutely or relatively. The total contribution of music and talk to revenue would be measured by the integral of the mvp curves (surface under the curves). But given that outsiders do not observe those curves, they cannot determine that value. However, the operators have, at least implicitly, such knowledge.

Observing the program mix (M^*, T^*) chosen by the broadcaster and the compensation of talk, which is available from the accounting data of the radio stations,¹³ say $\$T$, one obtains an implicit competitive market per minute price v equal to the total compensation of talk $\$T$ divided by the number of minutes of talk T^* , that is, $v = (\$T)/T^*$. The competitive market compensation of music can then be obtained as $vM^* = (\$T)(M^*/T^*)$.

The competitive market value of music is revealed by or inferred from the behavior and choices of the radio broadcasters.

Proposition (HR): The competitive market values/compensations of music and talk are necessarily proportional to their "shares" of broadcast time.

¹³ The compensation of talk may result from the exercise of some market power by popular hosts, although consumers' listening habits, a well understood factor of dynamic competition, may be more important than particular hosts' capacity to attract and maintain an audience. Nevertheless, if there is market power, the compensation of talk must be adjusted downwards. It does not seem farfetched to consider that although some hosts may be able to exercise some market power, the market for hosts is reasonably competitive. The light-shaded rectangle in Figure 1 is the competitive compensation level. An implicit assumption underlying Figure 1 is that the marginal cost of music and talk are both zero, at least around the intersection point. If this is not the case, the curves must be redefined as mvp net of marginal cost.

The above proposition does not follow from a heuristic or historical benchmark approach and is not an opinion, a belief, or a value judgement. It follows from (i) the assumption of profit maximization and (ii) two observable data elements, namely the chosen program mix (M^* , T^*) and the competitive market compensation of talk $\$T$ expressed as vT^* , which is willingly paid by the broadcasters.

An important caveat.

It may be useful to recall an important caveat here. Competitive markets compensate inputs at their marginal values, not at their total values for the firm (buyer), here the broadcasters: competitive market values of music and talk will be as usual much lower than their respective total values for the broadcasters. Hence, talk may be “more important” than music in terms of total value for radio broadcasters even in cases where the competitive market compensation of music is larger than that of talk.

In its 2002 digital pay audio services decision, the Copyright Board of Canada¹⁴ wrote: “*Although music may be what radio mostly provides, that does not mean that it is radio’s most important input. The most important part of programming is not necessarily what consumes the most airtime... Radio may be designed around the use of music and musical*

¹⁴ Canada’s *Copyright Act* was proclaimed in 1921, substantially amended in 1988, 1997 and 2012 (the *Copyright Modernization Act*), and currently under review. The Canadian copyright system recognizes two main rights, the communication or performance right and the reproduction right, and two main groups of rightsholders, the authors, composers and music publishers (group 1) and the performing artists, sound recording makers and music labels (group 2). The legal structure of copyrights in radio differ between countries; for a brief overview of those differences, see the Appendix in <https://cirano.qc.ca/files/publications/2018s-30.pdf>. The communication rights of authors and composers (music publishers) are managed by SOCAN, the Society of Composers, Authors and Music Publishers of Canada. The communication rights of performers and makers (record labels) are managed by Re:Sound (formerly known as the Neighbouring Rights Collective of Canada or NRCC). The reproduction rights of authors and composers (music publishers) are managed by CSI Music Services, a joint venture of CMRRA, the Canadian Musical Reproduction Rights Agency, and SODRAC, the Society for Reproduction Rights of Authors, Composers and Publishers in Canada. Finally, the reproduction rights of performers and makers (record labels) are managed by CONNECT Music Licensing (formerly known as Audio-Video Licensing Agency or AVLA) and SOPROQ, the Société de gestion collective des droits des producteurs de phonogrammes et vidéogrammes du Québec. Hence, copyrights in recorded music fall into four different baskets. In each basket, one finds a right and a rightsholders’ group. Given the particular features of national copyright laws and regulations and given the particular industry considered, some of those baskets may be empty, which may have an impact on the total royalty payments from users to rightsholders. The sharing of total royalty payments is an important issue by itself, but my concern here is the determination of the aggregate competitive value, not its distribution across the different baskets or rightsholders’ groups. Copyright royalties for musical works and sound recordings in HR are mainly determined through public hearings before the Canadian Copyright Board, which, in the absence of an agreement between the parties, is asked by rightsholders and/or broadcasters to set royalty rates. Those rates are set for blanket licenses to reproduce and/or broadcast copyrighted musical works and sound recordings. Blanket licenses significantly reduce transaction costs. The Copyright Board ascertains the competitive value of copyright in HR after hearing arguments from the disputing parties as well as direct and cross examinations of expert witnesses. In so doing, it may also rely on proxies and benchmarks, as well as agreements between parties in related contexts. In a sense, the Board acts as a surrogate for competitive markets in striking an equilibrium between the interests of rightsholders as willing sellers and the interests of broadcasters as willing buyers; in doing so, the Board makes sure that no market power is exercised on either side.

genres but as a cost, and (probably) as a drawing card, on-air talent is far more important” [page 10].

In that statement, which has been repeated many times since 2002, the Board clearly refers to the total values of music and on-air talent, not to their respective marginal values or competitive market values. The claim by the Board that “*as a drawing card, on-air talent is far more important*” may be true or false but, assuming it is true, it does not contradict the proposition that the competitive compensation of music will be larger than that of on-air talent if indeed the marginal (not total) value of music and the marginal (not total) value of on-air talent are the same while music is used more than on-air talent as a share of program time. There is no simple correspondence between the respective total values of music and talk for broadcasters and their competitive market values.

An illustrative application based on Canadian institutional context and data

To illustrate the practical power of the arguably simple model developed above, let us consider data from the Canadian radio industry. The figures are rounded out. The data to implement the above analysis is readily available from CRTC, Statistics Canada, and radio stations financial data. As shown above, we need two pieces of information: the share of programming time allocated to music and the programming costs of non-music content. Based on data obtained in the course of hearings before the Copyright Board of Canada, Audley and Boyer (2007)¹⁵ found that compensation of Talk amounts to 18.8% of total revenues, which would represent today about 300 million C\$ (out of total revenues of some 1.6 billion C\$). They also found that music represents on an “advertising rate weighted” average basis at least 60% of program time (the underlying data are presented in Boyer 2018b). Hence we can set $(M^*, T^*) = (60\%, 40\%)$. Applying the above Proposition (HR), the competitive market value of Music amounts to 18.8% times $(60/40) = 28\%$ or revenues, or $300(60/40) = 450$ million C\$ today.¹⁶

The total music royalties payable by the industry today, at the nominal (before deductions) rate of 11.15% of revenues amounts to about 180 million C\$.¹⁷ However, different

¹⁵ Audley and Boyer (2007) is an updated version of Audley, Boyer and Stohn (2004).

¹⁶ This is inclusive of HR cost of the music programming that is not related to royalties (about 1.9% of revenues). The amount would be larger if we were to consider a larger music share of program time. For instance, if we used Globerman (2007)’s estimated shares (70%, 30%), we would obtain $18.8(70/30) = 44\%$ of revenues or $300(70/30) = 700$ million C\$ for the competitive market value of music. Clearly, an “advertising rate weighted” average represents a better approach. On the other hand, if the competitive compensation of talk were 15% of revenues, the other 3.8% being due to hosts’ market power, the competitive market value of music would amount to $240(60/40) = 360$ million C\$.

¹⁷ In Canada, music royalties are paid by commercial HR stations as a percentage of advertising revenues (total revenues). Hence, the marginal cost of broadcasting more minutes of music is literally zero as the percentage of revenues appear as a fixed cost of music input. In other words, a station broadcasting music 45% of program time and another station broadcasting music 65% of program time, both with similar advertising revenues, would pay the same amount in music royalties.

deductions bring this amount down to 100 million C\$ or 6% of revenues.¹⁸ Hence the question: where is the missing 350 million C\$? We know already that some 80 million C\$ are due to different forms of deductions and exceptions, financed by rightsholders to the benefit of users, broadcasters, and other stakeholders. Hence the net amount missing and unaccounted for is today of the order of at least 270 million C\$. If music used in HR is mispriced as it appears to be, then its missing value is, as usual in such cases in any industry and for any input, captured by other stakeholders.

Who are the stakeholders of the HR industry? We can regroup those into five different groups. First, the music content providers, that is, authors, composers, songwriters, music publishers, artists, performers, makers of sound recordings, and record labels. Second, the talk content providers, that is, hosts, DJs, and other on-air personalities. Third, other inputs such as the owners, operators, managers, capital providers, workers, employees, materials and equipment suppliers, etc. Fourth, the advertisers who buy from the broadcasters the access to different niche audiences. And finally, the end consumers as listeners and their governments as their collective representatives. If this list of stakeholders is reasonably complete, they must collectively account for the value created but not captured by rightsholders, although it is not clear which stakeholders capture what shares of the missing competitive value of music. The identification of those stakeholders and their respective shares in the capture of music value remains an open question.¹⁹

Section 2. The Search for Value: Satellite Radio

As the terrestrial Hertzian radio industry, the satellite radio industry, more precisely the Satellite Digital Audio Radio Service (SDARS) industry, has many characteristics that make it suitable to derive or infer a competitive market value of music copyrights. It is a well-developed and established industry with good business data that one can analyze without too

¹⁸ In addition to different discounts implemented by the Copyright Board itself, there are numerous exceptions contained in the *Copyright Act* to favour dissemination, to curb excessive market power, to recognize freedom of expression and to recognize that original works always build on previous works. One most significant exception is known as fair dealing. It says that using copyrighted works for the purposes of research, private study, education, parody or satire, as well as criticism and review and news reporting, may not infringe copyright if certain conditions are satisfied. Those conditions have been established by the Supreme Court of Canada in decisions such as: *CCH Canadian Ltd. v. Law Society of Upper Canada*, 2004 SCC 13, [2004] 1 S.C.R. 339; *Alberta (Education) v. Canadian Copyright Licensing Agency (Access Copyright)*, 2012 SCC 37; *Society of Composers, Authors and Music Publishers of Canada v. Bell Canada*, 2012 SCC 36, [2012] 2 S.C.R. 326. Such admissible uses of authors' or creators' intellectual property do not require authorization and do not give a right to compensation. To avoid unintended harm and to foster efficient means of exchange between users and creators of copyrighted works, while respecting the rights of both, fair dealing must involve a balanced approach in accordance with the conditions and factors stipulated by the Supreme Court. For a theoretical economic discussion of those factors in light of the principles of balance and respect for the rights of all concerned, along with the principles of efficiency as put forward by the Supreme Court, see Boyer (2012).

¹⁹ Boyer (2018a) suggests that a solution “would involve the design of tariffs or contributions imposed at different stages of the value chain between creators and end consumers, hence on different beneficiaries of copyrighted musical assets, those beneficiaries being once again the direct users, ISP, equipment manufacturers, and end consumers and their Governments as their collectives.”

many restrictive a priori assumptions. We will see that the available public data allow us to derive a competitive market value of music in the SDARS industry although this industry is more a natural monopoly than a competitive industry.

What is the business of a satellite radio (SR) provider? We can assume that the objective is to maximize profits by attracting subscribers to its ad-free service and by capturing on its ad-based service a particular niche audience to be sold to interested advertisers. The SR provider achieves this by offering a combination of different genres of music, talk and music-talk stations, with talk comprising hosts, DJs, and other on-air personalities. The crucial decisions are then: the portfolio of genre-specific stations to offer and the specific mix of music and talk to provide on each of those stations in order to attract ad-free subscribers and ad-based audiences.

For profits to be maximized, the SR provider must evaluate how much subscribing and advertising revenues is generated by the program inputs used, namely music, talk and others. It must be the case that *at the margin*, talk and music used bring similar revenues, that is, have the same marginal contribution to profit. Otherwise, the SR provider would change the portfolio of genre-specific stations and the program station mix to get a higher level of profits.²⁰

The relevant fundamental proposition from economic theory is that the market value of an input is equal to its (marginal) contribution in increasing production (here the number of additional subscribers and listeners attracted) times the value to the SR provider of those additional subscribers and listeners.

In other words, the observed quantity of music used by the SR provider together with its capacity to attract subscribers and listeners as well as the value of those additional subscribers and listeners for the firm, all data typically known to the firm, will reveal the competitive market value of music. Indeed, if the competitive market price of a unit of music were given by or set at the value of those additional subscribers and listeners for the firm (the marginal value product of music), the firm would buy or provide the quantity of music it is using and providing. In that sense, the marginal value product of music is its competitive market value. Hence,

***The competitive market values/compensations/prices
of music and other inputs, such as talk, in satellite radio are necessarily
proportional to their relative capacities to attract subscribers and listeners.***

Again, the above proposition does not follow from a heuristic or historical benchmark approach and is not an opinion, a belief, or a value judgement. It follows from (i) the assumption of profit maximization and (ii) the relative capacities of different program

²⁰ Although the marginal production cost may be close to zero (natural monopoly), there is a non-zero marginal opportunity cost in determining the optimal portfolio of genre-specific stations and the program station mix.

contents to generate additional net revenues (their relative marginal value products). The combination of inputs chosen by the operators must satisfy the above proposition.

It may be useful to recall again the two caveats mentioned above, which applies here too. First, competitive markets compensate inputs at their marginal values, not at their total values for the firm (buyer), here the SR provider. Competitive market values of music and talk observed in SR will be as usual potentially much lower than their respective total values for the SR provider. Second, the competitive compensation of music may be larger than the competitive compensation of talk, even if or when talk content is “more important” than music in terms of total value to the SR provider.

An illustrative application based on US SiriusXM data.

SiriusXM offers “a dynamic programming lineup of commercial-free music plus sports, entertainment, comedy, talk, news, traffic and weather, including: an extensive selection of music genres, ranging from rock, pop and hip-hop to country, dance, jazz, Latin and classical; live play-by-play sports from major leagues and colleges; a multitude of talk and entertainment channels for a variety of audiences; a wide range of national, international and financial news; exclusive limited run channels; and local traffic and weather reports for 21 metropolitan markets throughout the United States” (December 2015 SEC 10-K filing of Sirius XM Holdings Ltd, page 2).²¹

We learn that it offers over 175 audio channels (72 ad-free, 15 news & issues, 11+ sports, 9 traffic & weather, 22 talk & entertainment, 18 Latin, 9 comedy, 14+ other), which subscribers/listeners can package in different ways. Its total revenues for 2015 reached US\$4.57 billion, of which 84% are due to subscribers, 2.7% are due to advertising, and 13.3% are composed of revenue and royalties from the sale of satellite radios, components and accessories and “amounts earned from subscribers for the U.S. Music Royalty Fee, revenue from our connected vehicle business and our Canadian affiliate and ancillary revenues.”²²

²¹ “SiriusXM is an American broadcasting company that provides three satellite radio and online radio services operating in the United States: Sirius Satellite Radio, XM Satellite Radio, and SiriusXM Radio. The company also has a major investment in Canada called SiriusXM Canada, an affiliate company that provides Sirius and XM service in Canada. At the end of 2013, Sirius reorganized their corporate structure, which made SiriusXM Radio Inc. a direct, wholly owned subsidiary of SiriusXM Holdings, Inc. SiriusXM Radio was formed after the U.S. Federal Communications Commission (FCC) approved the acquisition of XM Satellite Radio Holding, Inc. by Sirius Satellite Radio, Inc. on July 29, 2008, 17 months after the companies first proposed the merger. The merger brought the combined companies a total of more than 18.5 million subscribers based on current subscriber numbers on the date of merging. The deal was valued at \$3.3 billion, not including debt. Through Q3 2016, SiriusXM has 31 million subscribers.”

²² We learn from SiriusXM website that “Music royalty rights were established by Congress and are the product of the Copyright Act. Unlike terrestrial radio, SiriusXM is required to pay copyright music royalties to recording artists, musicians and record labels that hold copyrights in sound recordings (the actual recording of a work) that were fixed after February 15, 1972. Like terrestrial radio, SiriusXM must also pay music publishers who hold copyrights in musical compositions (or the lyrics and music) through their collective organizations, such as ASCAP and BMI. The U.S. Music Royalty Fee funds existing and anticipated royalties payable by SiriusXM to composers, publishers, recording artists, musicians and record labels that hold copyrights in musical works and sound recordings.”

Total royalties reached 10% of total revenues in 2015 (9% in 2013, 11% in 2017) or US\$457 million, with the number of subscribers reaching 29.6 million.

Available data from SiriusXM allow us to determine the competitive market value of music in satellite radio. To do this, we first consider the contract SiriusXM signed with its main talk attraction namely host Howard Stern (HS). We are able to determine what the profitability of this host is for SiriusXM and how his compensation is linked to this profitability. We then apply the same methodology to determine the competitive value of music to SiriusXM. The data come from the 2006 hearings before the US Copyright Royalty Board and in particular from Pelcovits (2006).

The market price SiriusXM would pay for music should be consistent with the market price SiriusXM paid for HS on a per-customer-acquired basis. SiriusXM paid HS approximately \$415 million in net present discounted value for five years. Financial analysts, some of them briefed on the Stern transaction by SiriusXM, put the number of incremental subscribers Sirius expected to gain from HS programming at less than 1.75 million. Hence, SiriusXM paid \$237 per incremental subscriber to HS (\$415 million divided by 1.75 million subscribers).

Using a 42 month average life for the typical SiriusXM listeners, Pelcovits calculates that SiriusXM paid HS \$5.64 per month for each incremental subscriber (\$237 divided by 42). SiriusXM is expected to generate \$10.25 per subscriber per month in 2006, rising to \$11.65 in 2010 (the last year of Stern's contract). Hence, SiriusXM paid HS from 48% ($\$5.64/\11.65) to 55% ($\$5.64/\10.25) of revenue generated by his programming. That makes an average of slightly above 50% of revenue.

Wind (2006, Appendix K, Figures 1 and 2) estimated, from a survey he conducted on SiriusXM subscribers that 41% of subscribers would drop the service if there were no music and 15% more would be willing to pay a reduced price. Pelcovits shows that if SiriusXM were to drop its price, absent music, to keep all 59% of subscribers still on board, revenues would drop by more than if SiriusXM maintained its original price thereby losing 56% (41% + 15%) of its customers and revenues. The second alternative is better and therefore, one can conclude that music generates an estimated 56% of subscribers.

If music content were to receive 50% of the revenues generated by the 56% of those subscribers who would drop the service if there were no music, it would receive 28% ($50\% \times 56\%$) of SiriusXM revenues. In other words, based on what SiriusXM paid for HS programming, one would expect music content to receive, in a similar marketplace transaction, 28% of SiriusXM revenues.

With revenues of US\$4.57 billion in 2015, this would represent US\$1.28 billion in music royalties, Given that SiriusXM paid 10% of revenues (US CRB PSS-SDARS decision 2012) in royalties in 2015, the missing value amounts to US\$823 million.²³

Where is that missing value? As argued above, if music is mispriced as it appears to be in SR, then its missing value is, as usual in such cases in any industry and for any input, captured by other stakeholders.

Who are the stakeholders in the value created by the SR industry? As in the HR industry, we can regroup those into five different groups: the music content providers, the talk content providers, the other inputs providers (owners, operators, managers, capital providers, workers, employees, materials and equipment suppliers), the advertisers, and finally the end consumers and their governments as their collective representatives. Those stakeholders, other than music providers, collectively capture the missing competitive value due to rightsholders. Again, it is not clear who captures what share of that missing value.

Section 3. The Search for Value: Interactive Music Streaming Services

The interactive music streaming services industry has characteristics that make it suitable to generate an objective market-based value of music copyrights. It is an unregulated industry with sophisticated buyers and sellers of licenses to access repertoires of musical works and sound recordings and with good business data. One can analyze the industry without too many restrictive assumptions. This industry is in a sense simpler than HR and SR industries because there is only one content, namely music. Although we have no other content input with a market-based compensation from which to infer the value of music, we will see that it is nevertheless possible to do so.

What is the business of an interactive music streaming service? We can assume that the objective is to maximize profits by attracting subscribers. The provider achieves this by offering a freemium service, that is, a service offering basic features with advertising, and a premium service with paid subscriptions offering additional features including improved streaming quality, offline music downloads, and significant flexibility to choose one's preferred music and artists, while giving access to a large repertoire of sound recordings embedding musical works.

The crucial challenges for a service provider are to negotiate with music labels the acquisition of the largest possible repertoire at the lowest possible cost and to price its offering given the characteristics of other offerings on the market. Given that an interactive music streaming

²³ It is possible that Howard Stern may have been able to exercise some market power in his negotiation with SiriusXM. If that is so, one might conjecture that his competitive compensation would be 20% lower (a significant market power margin), that is, 40% rather than 50% of the revenues he generated for SiriusXM. The derived competitive compensation of music at 40% times 56%, hence 22.4% of revenues, would reach slightly over US\$1 billion in 2015, generating a missing value of US\$567 million. In the SDARS II decision (2012) the SiriusXM rate goes up to 11% in 2017, while in the SDARS III decision (2017), it is fixed at 15.5% for the period 2018-2022. The 2018 Music Modernization Act extended this SiriusXM rate to 2027.

service is simply repackaging and reselling music the revealed competitive market value of music is directly obtained through the financial data of the service provider.

The competitive market value/compensation/price of music in the interactive music streaming services industry is the willingly negotiated per-play rate, which includes a premium for interactivity.

The above proposition or theorem rests on the relatively or reasonably competitive negotiation process in place between sophisticated players or agents on both sides of the transaction, namely the interactive music streaming services and the music labels. Again, the proposition does not follow from a heuristic or historical approach and it is not an opinion, a belief, or a value judgement.

An illustrative application based on business and financial data from Spotify.

Overall, Spotify negotiates licenses/contracts with record labels and media companies to use their repertoire and make it available to its customers/listeners. The payments made by Spotify may be considered “reasonably competitive” given the presence of sophisticated negotiators on both sides of the transactions and significant deep-pocket competing buyers, even though the latter are facing Cournot-Complement oligopolistic sellers. Sophisticated negotiators on the buying side of the transaction is likely balancing the market power of the sellers.²⁴

Let us consider the data from Spotify and compare them with data from the noninteractive music streaming service Pandora. Spotify is primarily an interactive streaming service present worldwide. It has 90 million active global users as of December 2015, of which 31.5% are subscribers responsible for 90% of revenues.²⁵ Other listeners are on the free but constrained and ad-based service. Spotify has about 20 billion listening hours per year or 300 billion plays

²⁴ In fact, the theory of monopolistic and oligopolistic market power models sellers as facing unsophisticated atomistic buyers represented by the demand function, not sophisticated identifiable buyers. Whether royalty rates negotiated by Spotify represent “competitive rates” was discussed by the US Copyright Royalty Board in Web IV (December 2015). One can read in that decision: “The Services’ economists equate the ‘effectively competitive’ requirement as essentially equivalent to the economic concept of ‘workable competition.’ In its essence, [as Carl Shapiro stated,] a workably competitive market is one not subject to the exercise of significant market power” (pages 58-59). Later on in the decision, one reads: “Dr. Shapiro opined: ‘In the parlance of economics, the ‘must have’ suppliers are complements, not substitutes, because buyers need each of them and cannot substitute one for another This concept is well known in economics. When two essential inputs must be used together, they are often referred to as ‘Cournot Complements.’ The evidence ... shows that the repertoires of the major record companies are Cournot Complements for interactive services... The evidence shows clearly that the major interactive services ‘must have’ the music of each major record company to be commercially viable. The repertoires of the major record companies are not substitutes for each other in the eyes of either interactive services or the record companies themselves. This means that there is no true ‘buyer choice’ in this market. Thus, the market for licensing recorded music to interactive services is not workably competitive” (page 60). This analysis appears to fail to identify the market power of well-informed and sophisticated oligopolistic buyers.

²⁵ Data on Spotify obtained from *Music Business Worldwide* (Tom Ingham, May 23 2016), based on Spotify’s financial filing in Luxembourg: <https://www.musicbusinessworldwide.com/spotify-revenues-topped-2bn-last-year-as-losses-hit-194m/>

per year and its annual revenues are €1.95 billion in 2015 with an 80% growth rate between 2015 and 2014 after a 45% growth rate between 2014 and 2013.

Spotify incurred in 2015 content acquisition costs of €1.63 billion or 83.6% of its revenues. Content acquisition costs are almost totally royalties and are function of the country of sales, the number and percentage of subscribers, the relative country premium pricing and exchange rate, the country laws and regulations on copyrights. This represents an 85% growth rate between 2015 and 2014 after a 46% growth rate between 2014 and 2013.

Hence the per-play rate paid by Spotify in 2015 is €0.0054 (or US\$0.006) per play.

Pandora²⁶ is primarily a noninteractive streaming service mainly present in the U.S. It has some 81 million active users in December 2016, of which 4.4 million are subscribers (5.4% of users).²⁷ Pandora claims 20 billion listener-hours.²⁸ It is interesting to note that the total radio listening hours in the U.S. in 2016 is split as follows: HR 79%; Pandora 10%; SR 8%; others 3%. Of the total music streaming hours in the U.S. in 2016, 55% were on Pandora, 32% on Spotify, 8% on iHeart, and 5% on other platforms; on a worldwide basis, Pandora and Spotify have about the same number of listening hours. Pandora's annual revenues reached US\$1.385 billion in 2016 and its content acquisition costs (royalties) reached US\$734.4 million or 53% of revenues. Hence the royalty rate paid by Pandora in 2016 is US\$0.00245 per play.

To compare the per play rate of Pandora and Spotify, we must account for the value of interactivity or selectivity that is present on Spotify but not or much less on Pandora. Using data from the music downloads delivery platforms, we can estimate that the value of selectivity, measured as the price for downloading one single track from an album relative to the per track price for downloading the whole album, is 1.92.²⁹ Hence, the noninteractive per play rate equivalent to the interactive per play rate paid by Spotify can be estimated as $US\$0.006/1.92 = US\0.003125 , about 28% more than Pandora's per play rate paid in 2016.³⁰

This indicates that if Spotify per play rate paid in 2015 corresponds to the reasonably competitive market value of music on interactive music streaming services, then the Pandora per play rate should be 28% higher than it is in 2016, that is, Pandora royalties are too low by

²⁶ Pandora, U.S. SEC 10-K filing for 2016 <http://investor.pandora.com/Cache/38090352.pdf>

²⁷ Those users have created some 7 billion stations on Pandora since 2005 (each subscriber can create 100 stations) versus less than 4000 terrestrial radio stations in the U.S.

²⁸ About the same as total listener-hours to music-format radio stations in Canada, of which recorded music account for 65.7%.

²⁹ Boyer, Blit and Audley (2013). In the Web IV decision, one reads: "According to Dr. Rubinfeld, the survey results from Dr. McFadden's conjoint survey indicated an interactivity ratio of 1.90", which measures the ratio of interactive subscription prices to noninteractive subscription prices, hence the value of interactivity for the consumers.

³⁰ Using a selectivity premium from the music downloads delivery platforms rather than a direct comparison of negotiated rates between interactive and noninteractive webcasting, such as the Spotify versus Pandora-Merlin negotiated rates for instance, allows us to avoid the steering effect present in the negotiated settlements.

US\$202 million in 2016. In other words, the competitive market value of music on Pandora is about US\$936 million compared to royalties effectively paid of US\$734 million.³¹

This undervaluation of music on Pandora noninteractive streaming service is most probably due to the regulatory institutional framework that rules royalty rate fixing and directly influences and determines Pandora per play rate, while it influences only indirectly Spotify per play rate. Again, if music is mispriced as it appears to be on Pandora, then its missing value is, as usual in such cases in any industry and for any input, captured by other stakeholders, including the owners, operators, managers, capital providers, workers, employees, materials and equipment suppliers, the advertisers, and the end consumers as subscribers/listeners and their governments as their collective representatives.

Section 4. The Three Legged Stool of Music Value

The proper value of music and the ensuing fair compensation of creators correspond to what would be paid on well-functioning competitive markets. In a general context with multiple parties as buyers and sellers, a *competitive equilibrium* is a situation in which economic forces are balanced with a stable resting point suitable for both willing buyers (demand) and willing sellers (supply).

When considering whether or not to use a unit of a good or factor, buyers would compare the (marginal) utility or value derived from the use of the unit to the market price and buy only if such value is larger than the price.³² Similarly, the sellers would compare the (marginal) cost of producing and making the unit available to the market price and agree to produce and sell the unit only if such cost is less than or equal to the price.

Therefore, a price that corresponds to a competitive market price or a properly negotiated price would necessarily account for balance between creators' interests and users' interests since any investments, costs including opportunity costs, risks, and derived benefits would be incorporated in the demand and supply functions and would thus be reflected in the resulting competitive market or negotiated price. Given this price, the buying party is deriving maximal value from using the good or input and the selling party is properly and fairly compensated for its costs, each party being free to accept the transaction.

³¹ The difference in music value between interactive and noninteractive streaming services may also be a function of the must have / essential facility nature of sound recordings for interactive streamers. The major record companies, as copyright owners, control large percentages of sound recording copyrights, and interactive services *must* make these sound recordings available to their subscribers in order to tout the unlimited nature of their service. By contrast, noninteractive services utilize algorithms and other forms of curation to select sound recordings for their listeners. As was detailed in the Web IV determination (December 2015), this distinction reduced by the must have / essentiality value of sound recordings their value to interactive streaming services.

³² When users are businesses in the music reselling industries, the value derived corresponds to the economic concept of "derived demand", as the value those businesses attach to music is obtained or derived from the value the end customers attach to music, hence are willing to pay for, or wishing to listen to, one way or another.

However, as mentioned above, musical works are different from standard goods like apples or cars; they are information goods.³³ In the context of musical works, negotiations are typically conducted between parties, implicitly or explicitly. Thus, a properly negotiated price between sophisticated and symmetric parties is analogous to a reasonably competitive equilibrium price.

Differences in cost structures, namely cost of entry and cost of audience reach, favor different royalty formulas in different industries although those industries compete with each other up to a certain point for subscribers and listeners' ears.

In HR and SR industries, costs of entry (broadcasting spectrum license) and fixed costs of audience reach (broadcasting equipment) are relatively high while marginal costs of audience reach are relatively low, even zero. This favors a percentage of revenues formula. In music streaming and webcasting services industry, costs of entry are relatively low while quasi-fixed and marginal costs of audience reach (bandwidth costs) are higher and increasing with audience size. This favors a per play rate formula. The costs of entry and fixed costs of audience reach in HR and SR dwarf the costs of entry and quasi-fixed costs of audience reach in music streaming and webcasting. But marginal costs of audience reach are smaller in HR and SR than in are small compared to music streaming and webcasting.

A percentage of revenues formula means that the marginal cost of music use by terrestrial or satellite radio providers is zero since two radio stations using the same amount of music but generating different revenues would pay different royalties while two stations generating the same revenues but using different amounts of music would pay the same royalties. In a sense, under a percentage of revenues formula, royalties are a "fixed cost" independent of music use but dependent on the success of the firm in generating revenues. As such, it is a risk sharing formula between rightsholders and users.

Per play rates in webcasting and music streaming services allow rightsholders to avoid being "residual payees" and favor healthy competition by eliminating uncompetitive webcasters who might use huge amount of recorded music with little revenue generating capacity, thereby reducing destructive competition intensity (Bertrand trap) and inducing webcasters, as resellers of recorded music, to develop value added features such as interactivity (Spotify) or genomic features (Pandora).

³³ Despite this particularity, the same fundamental principles apply. However, two possibilities arise: either users pay the same price regardless of the value they derive from the work or users pay some proportion of the (marginal) value they derive from the good. The latter case, which takes into account the marginal value derived by a user, is referred to as Lindahl pricing.

Hence, royalty formulas expressed as percentages of revenues are socially efficient for HR and SR and royalty formulas expressed as per play rates are socially efficient for interactive and noninteractive music streaming or webcasting services.³⁴

In Sections 1, 2 and 3, we derived the competitive market value of copyrights in music from three different industries and three different methodologies, defining the three legged stool of music value.

We showed in Section 1 that for commercial terrestrial Hertzian radio, the relative competitive market values of music and talk are necessarily proportional to their respective shares of program time. In the Canadian context this value is equal to 28% of revenues. And it is socially efficient that royalties be expressed as a percentage of revenues.

We showed in Section 2 that for satellite radio, the relative competitive market values of music and talk are necessarily proportional to their relative capacities to attract subscribers. In the case of US SR (SiriusXM), this value is equal also to 28% of revenues. And it is socially efficient that royalties be expressed as a percentage of revenues.

We showed in Section 3 that for interactive music streaming services, the competitive market value of music corresponds to the unregulated and negotiated per-play rate paid by interactive music streaming services, including the value of interactivity. In the case of interactive music streaming service Spotify, this value is equal to 0.60 US¢/play (or US\$6.00 per 1000 plays). In the case of noninteractive music streaming service Pandora, this value is equal to 0.31¢/play (or US\$3.13 per 1000 plays). And it is socially efficient that royalties be expressed as a per play rate.

All three value estimates, qualifying as competitive market values, were obtained from observing the behavior and choices of operators and users, not from value judgments, and point to a similar competitive market value!

The competitive values are somewhat similar

Given that the three music distribution technologies (HR, SR and OMS) are competing for listeners' ears, we must make sure that competition takes place on a level playing field. To verify if the above royalty formulas and rates satisfy this requirement, we must translate them into comparable royalty rates and payments.

The competitive market values of music in the Canadian HR industry and in the US SR industry were found to be 28% of revenues.³⁵ Although we do not have the number of plays

³⁴ See also the extensive discussion of different royalty formulas in United States Copyright Royalty Judges - The Library of Congress, Determination of Royalty Rates and Terms for Making and Distributing Phonorecords (Phonorecords III), Docket No. 16-Crb-0003-Pr (2018-2022), January 26 2018, pages 15-29.

³⁵ It might be of interest to note that the Copyright Board of Canada in its 2002 decision pertaining to Digital Pay Audio services wrote: "As stated earlier, before accounting for the non-eligible repertoire, the lower end of the range within which the Board intends to set the rate is somewhat less than 20 per cent, while the higher end of that range is somewhat more than 30. In the Board's view, the factors that tend to increase the rate are more

on satellite radio, we do have a good estimate of that number on Canadian HR radio. Given the number of listeners and the percentage of program time devoted to music on Canadian terrestrial radio, the 28% of revenues corresponds to a per play rate of between 0.235 C¢/play (based on Audley-Boyer 2007) and 0.324 C¢/play, based on the average of five different reports.³⁶ These per play rates can be directly compared to rates paid by noninteractive music streaming services. We showed above that noninteractive service Pandora paid in 2016 a per play rate of 0.245 US¢/play while its competitive market value rate, based on Spotify rate, should be 0.31 US¢/play, which is somewhat of the same order as the competitive market value of music in HR and SR, before adjusting for the exchange rate.

As for interactive music streaming services, the above rates must be adjusted upwards for the value of interactivity (+92% from music downloads³⁷), which takes us to a range of 0.451 C¢/play (Audley-Boyer) to 0.607 C¢/play (average of the five different reports). We showed above that interactive streaming service Spotify paid in 2015 a per play rate of 0.600 US¢/play, which is somewhat of the same order, before adjusting for the exchange rate.³⁸

important than those that tend to decrease it. Under the circumstances, the Board has chosen a starting point of 26 per cent.” Moreover, as mentioned above, the Board wrote in the same decision: “*The most important part of programming is not necessarily what consumes the most airtime ... Radio may be designed around the use of music and musical genres but as a cost, and (probably) as a drawing card, on-air talent is far more important*” (page 10). This means that in the Board’s view, the music content generates *far* less than 50% of commercial radio revenues. To compare apples with apples, the royalty rate for music in commercial radio when reported as a percentage of revenues generated by music is larger than 11.15%/(<50%), that is, larger than 22.3%. If we use 40% instead, we obtain 11.15%/40%, that is, 27.9%. Those are the rates to compare with the DPA rate where 100% of revenues is generated by music. See Boyer and Faye (2018).

³⁶ Those estimates would include the following obtained through different methodologies applied to different periods, different contexts, and different samples: (70%, 30%) in Globerman (2007); (81%, 19%) in Erin Research (2008); (81%, 19%) in Copyright Board of Canada (2014); and (67%, 33%) in Touve (2015); for an average of (71%, 29%). Given that the Canadian HR industry currently pays about 100 million C\$ per year (about 180 million C\$ before deductions) in music royalties, this corresponds to 0.052 C¢/play (Audley-Boyer 60/40) or to 0.044 C¢/play (average of five reports 71/29) or to 0.039 C¢/play (Board’s 2014 81/19). Therefore, the Canadian HR industry currently pays between 0.039 C¢/play and 0.052 C¢/play.

³⁷ Boyer, Blit and Audley (2013) claim that “Information provided in the witness statement filed at Exhibit CSI-02 indicates that the average price paid for tracks downloaded as part of bundles was \$0.5975 in 2012, while the average price for individual tracks selected by the consumer was \$1.1474, or 92% higher.” There are other estimates of the value of interactivity ranging from 50% upwards.

³⁸ A note on YouTube (Google) may be useful here. According to the RIAA, which represents the major music companies, YouTube pays 0.1 US¢/play in royalties. As Cary Sherman, Chairman and CEO of RIIA, puts it: “it makes no sense that it takes a thousand on-demand streams of a song for creators to earn \$1 on YouTube, while services like Apple and Spotify pay creators \$7 or more for those same streams” (<https://medium.com/@RIAA/2016-a-year-of-progress-for-music-4e9b77022635>). YouTube claims on the other hand that it is advertising-based and therefore more comparable to HR radio than to subscription-based interactive webcasting like Apple Music and Spotify. Recall that the Canadian HR industry pays between 0.039 C¢/play and 0.052 C¢/play, while Apple Music pays about 1.2 US¢/play, Spotify 0.6 US¢/play (although the RIAA claims that Spotify pays closer to 0.7 US¢/play), and Pandora 0.245 US¢/play. Beard and al. (2017) claim that “Using 2015 data ... a plausible royalty rate increase [on YouTube, based on an average royalty rate between noninteractive streaming and interactive streaming rates] could produce increased royalty revenues in the U.S. of \$650 million to over one billion dollars a year.” On safe harbour provisions of DMCA, see <http://www.hypebot.com/hypebot/2017/01/youtubes-safe-harbor.html>

The competitive values need not be similar

As mentioned above, different business models in the use and reselling of music means that the competitive market values, taking into account opportunity costs to rightsholders, may differ between music delivery technologies. Because of the information good character of music, prices could and in a sense should differ across users. With information goods or assets, the problem is somewhat more difficult than for ordinary goods since the same unit (think of a musical work or sound recording) can be listened to and enjoyed many times by many different users or consumers now and in the future as consumption does not destroy or alter the unit consumed. The optimal production level will therefore involve the marginal cost and the *sum* of marginal values enjoyed over time by all users: as long as the former is lower than the latter, it will be welfare enhancing to produce or offer the unit in question. And additional units should be produced (for efficiency) as long as the sum of marginal values enjoyed over time through multiple uses by multiple users remains above the marginal cost incurred by creators as investors, hence till the point where the two are equal. Meeting such a condition is difficult as it implies, when the sum of marginal values is equal to marginal cost, that marginal values across users will differ.³⁹

As the Copyright Board of Canada wrote in its Digital Pay Audio 2002 decision, “The objectors assert that different business models should not result in different prices, or that different purchasers should not pay different prices for the same input. This is simply incorrect as regards information in general and intellectual property in particular. The whole movie market is premised on the ability to price discriminate. The same is true of performing rights, whose price often is related in part to the importance of music to the activity being carried out. Finally, because of differences in revenue and cost structures, an equivalent price for one type of users may require a higher rate. As commercial radio stations like to point out, an important share of their revenues flow from programming which is not music; this hardly can be said to be an irrelevant circumstance.”

A full treatment would take us too far for the purpose of this article. Suffice it to mention that the information good character of music and the differences in business models used means that prices of music need not be close to each other across industries to qualify as efficiency-prone prices.⁴⁰

Conclusion

The analysis shows that the difference between the competitive market value of copyright in music, both musical works and sound recordings, and the royalties paid by users/operators

³⁹ In fact, the different users acquire an *access* to the asset represented by rightsholders’ repertoire. Hence, one could relate royalties to an access price, as suggested by Strickler (2015). Although Strickler argues in favour of the Baumol-Willig access pricing formula, the case of copyright might more closely be amenable to the Laffont-Tirole Global Price Cap formula (Boyer and Robert 1998).

⁴⁰ For more on this issue, see Boyer and Faye (2018).

may be qualified as significant. In the Canadian HR radio industry, the competitive market value of music is up to 4.5 times larger than the current level of royalty payments: 28% versus 6% of revenues. In the US SDARS industry (SiriusXM), the competitive market value of music is up to 2.8 times larger than royalty payments (2015): 28% of revenues versus 10%. In noninteractive webcasting (Pandora), the competitive market value of music is 28% larger than royalty payments (2016): 0.312 US¢/play versus 0.245 US¢/play. In all these cases, royalty rates are determined by regulatory bodies.

As for the interactive webcasting or music streaming industry (Spotify), it can be considered at the proper level (0.600 US¢/play in 2015), given the unregulated negotiation process between Spotify and rightsholders (mainly music labels) in that industry. As shown above, all these estimates of the competitive market value of music copyrights point to a similar ballpark figure, but, as discussed, those values need not be rigorously similar. It is however somewhat comforting that they point to market value levels compatible with a level playing field of competition among industries, delivery platforms, and technologies.

It is important to recall once again that the above estimates of the competitive market value of copyrights in music were obtained neither from a heuristic or historical approach nor from opinions, beliefs, or moral value judgments. They follow from the assumption of profit maximization and the observed behavior and choices of users/operators.

This begs the questions: Where are the missing values? If Governments and royalty-fixing authorities (copyright boards and commissions) design and implement rules, regulations and exceptions that produce royalty rates significantly below competitive market values, thereby implicitly expropriating part of rightsholders' assets, who should pay for such policies?⁴¹

One must exert care in generalizing the results of Sections 1, 2 and 3 across different jurisdictions and industries as copyright structures may differ. But the methodologies to characterize the competitive market value of copyrights in music could be used in other jurisdictions to discover and unveil the relevant data and to derive credible estimates of the competitive market value of music copyrights.

⁴¹ This question is tackled in Boyer (2018a) who proposes a mechanism “to bring all ‘beneficiaries’ (primary users – HR, SR, and online music services –, ISP, equipment manufacturers, end consumers, and Governments) into one class or group of stakeholders and to make that group as a whole jointly and severally responsible for ensuring the proper competitive market compensation of creators. Those beneficiaries would be responsible for finding a sharing formula to determine their respective contributions and to foot the bill, a complex but feasible endeavor.” The solution would possibly mean using a Shapley value approach to achieve “the design of tariffs or contributions imposed at different stages of the value chain between creators and end consumers, hence on different beneficiaries of copyrighted musical assets, those beneficiaries being once again the direct users, ISP, equipment manufacturers, and end consumers and their Governments as their collectives.”

Appendix A: the data underlying $(M^*, T^*) = (60\%, 40\%)$

In the Audley-Boyer model, the (M^*, T^*) is an advertising-price (rate card) weighted share of music and talk across different parts of the day. The following Tables present the data. Tables 1 to 7 are the self-explanatory building blocks to obtain the weighted average 60-40 sharing obtained in Table 8. Such tables could be built for any jurisdiction; hence the interest of presenting them here.

**TABLE 1: Breakdown of Program Content: Sample Stations, 2003-2004
(% of broadcast hours devoted to M and T – by day part and all day)**

Day Part	Program Type	Program Content Breakdown
6:00 a.m.-9:00 a.m.	Sound recordings (M)	63.5%
	Other programming (T)	36.5%
9:00 a.m.-3:00 p.m.	Sound recordings (M)	77.8%
	Other programming (T)	22.2%
Noon - 1:00 p.m.	Sound recordings (M)	70.5%
	Other programming (T)	29.5%
3:00 p.m. - 4:00 p.m.	Sound recordings (M)	83.5%
	Other programming (T)	16.6%
4:00 p.m. - 6:00 p.m.	Sound recordings (M)	77.7%
	Other programming (T)	22.3%
6:00 p.m. - 7:00 p.m.	Sound recordings (M)	76.6%
	Other programming (T)	23.4%
7:00 p.m. - Midnight	Sound recordings (M)	79.2%
	Other programming (T)	20.8%
All Day	Sound recordings (M)	76.1%
	Other programming (T)	23.9%

Source: Erin Research (2004)

**TABLE 2: Percentage Breakdown of Broadcast Hours
6:00 a.m. – Midnight, 2003-2004**

Type of Broadcast	% of broadcast hours excluding commercials	% of all broadcast hours including commercials
Sound recordings	73.7	67.3
Newscasts	5.9	5.4
Other programming	17.3	15.8
Station IDs/Promos	3.1	2.8
Commercials	-	8.7
Total	100.0	100.0

Source: Erin Research (2004)

TABLE 3: Aggregate Hours per Week of Listening (000s and %)

Day Part	Hours of Listening (000s)				% of Listening hours				4-year average
	1990	1995	2000	2002	1990	1995	2000	2002	
6 a.m. - 9 a.m.	87,626	92,828	2,083	90,710	22.22%	21.13%	21.55%	20.97%	21.47%
9 a.m. - 3 p.m.	167,086	192,352	185,619	189,495	42.37%	43.78%	43.45%	43.82%	43.36%
3 p.m. - 7 p.m.	87,133	99,026	99,267	101,504	22.10%	22.54%	23.24%	23.47%	22.84%
7 p.m.- midnight	52,477	55,146	50,256	50,764	13.31%	12.55%	11.76%	11.74%	12.34%
TOTAL	394,322	439,352	427,225	432,472	100.0%	100.0%	100.0%	100.0%	100.0%

Source: BBM Survey, Statistics Canada

TABLE 4: Estimated Share of Listening to Program Content Accounted for by Sound Recordings

Day Part	% of Listener Hours	Sound Recordings as % of Program Content	Weighted Share of Program Listening
6:00 a.m. – 9:00 a.m.	21.47	63.5	13.6
9:00 a.m. – 3:00 p.m.	43.36	77.8	33.7
3:00 p.m. – 7:00 p.m.	22.84	78.8	18.0
7:00 p.m. – Midnight	12.34	79.2	9.8
Total 6:00 a.m. - Midnight	100.0	76.1	75.1

Source: Erin Research (2004), Statistics Canada, and Tables 1 and 3

TABLE 5: Distribution of Commercials Compared to Distribution of Listening Hours by Day Part

Day Part	Hours of Commercial Broadcast Time/week	Commercials as % of Broadcast time by Day Part	% of All Commercial Time/Week	% of Total Listening Hours/Week by Day Part
6:00 a.m. – 9:00 a.m.	2.42	11.5%	22.0%	21.47%
9:00 a.m. – 3:00 p.m.	3.84	9.1%	34.9%	43.36%
3:00 p.m. – 7:00 p.m.	2.52	9.0%	22.9%	22.84%
7:00 p.m. – Midnight	2.22	6.4%	20.2%	12.34%
TOTAL	11.00	8.7%	100%	100%

Source: Erin Research (2004)

TABLE 6: Estimate of Percentage of Commercial Revenue Generated by Each Day Part

Day Part	% of hours in each day part	% of commercial time in each day part	Average commercial rate for day part (based on index of 1.00 for 6-9 am)	Estimated contribution of each day part to commercial revenue
6:00 a.m. – 9:00 a.m.	16.7	22.0	1.00	25.9%
9:00 a.m. – 3:00 p.m.	33.3	34.9	.86	35.4%
3:00 p.m. – 7:00 p.m.	22.2	22.9	.86	23.2%
7:00 p.m. – Midnight	27.8	20.2	.65	15.4%
Total 6:00 a.m. –Midnight	100.0%	100.0%		100.0%

Source: Table 5 and Audley, Boyer and Stohn (2004, Appendix B)

TABLE 7: Breakdown of Content of an Average Hour of Broadcast Time

	6:00 a.m. to 9:00 a.m.	9:00 a.m. to Midnight
Sound Recordings	32.8 minutes	41.9 minutes
Newscasts	7.8 minutes	2.3 minutes
Other Programming	11.1 minutes	9.1 minutes
Station IDs/ Promos	1.4 minutes	1.8 minutes
Commercials	6.9 minutes	4.9 minutes
Total	60.0 minutes	60.0 minutes

Source: Erin Research (2004).

TABLE 8: Value Attributed to Sound Recordings and Other Content (Weighted by Commercial Value)

Day Part	% of Commercial Value	Program Content Value Attributed to Sound Recordings	Value Attributed to Other Program Content
6:00 a.m. – 9:00 a.m.	25.9%	12.95% (1/2)	12.95% (1/2)
9:00 a.m. Midnight	74.1%	49.40% (2/3)	24.70% (1/3)
TOTAL	100.0%	62.35% or 60%	37.65% or 40%

Source: Tables 1 to 7.

Because the Audley-Boyer estimate of (M*, T*) is an advertising-rate weighted share of music and talk across different parts of the day, it is not directly comparable to, but is in a sense more rigorous than other estimates of the shares of music and talk in programming that are presented on the basis of unweighted absolute minutes of broadcasting.⁴²

⁴² Those estimates would include the following obtained through different methodologies applied to different periods, different contexts, and different samples: (70%, 30%) in Globerman (2007); (81%, 19%) in Erin Research (2008); (81%, 19%) in Copyright Board of Canada (2014); and (67%, 33%) in Touve (2015) who writes: “Estimating the number of songs played per hour on US Radio appears to be a mix of Art and Science.”

Appendix B: The 2005/2008 Commercial Radio Decision of the CCB

The Canadian Copyright Board (CCB) rendered an important decision in 2005, raising by 31.25%, from 3.2% to 4.2% of revenues, the royalty rate for the use by commercial radio stations of the communication right of musical works and sound recordings.⁴³

Although this is a specifically Canadian case, the arguments and principles put forward as well as the lessons, challenges and pitfalls learned as well as the errors made are relevant for the world of copyright; hence the interest of discussing the case here.

The 2005 decision rocked the radio broadcasting industry and was appealed by the Canadian Association of Broadcasters. The Federal Court of Appeal judgment asked the Board to reconsider its 2005 decision and make its underlying arguments and reasons more explicit. Following new hearings, the CCB rendered a new decision in 2008, which reaffirmed its 2005 decision to raise significantly the royalty rate.⁴⁴

It is not an easy matter to identify the proper price or compensation of music given the very particular characteristics of musical works as information goods, the structure of the commercial radio industry, the basis on which it has access to sound recordings, and the resulting absence of a competitive market process for determining the price of access to and use of music. However, the objective must be to find a price that would ensure that operators of music radio stations are properly compensated, that is, a price that would ensure a competitive risk-adjusted rate of return on capital (RAROC), and that creators, as authors, composers, performers and makers, are properly, that is, competitively compensated.

In its 2008 decision, the CCB relied in part on a model proposed by the Canadian Association of Broadcasters (the Globerman report) with some modifications and adjustments. Globerman cleverly associates the rightsholders' repertoire acquired by radio station operators to the acquisition of an asset.⁴⁵ The Board stated that "The CAB provided us with a broad economic approach to assess the global value of music" [B52]⁴⁶; and affirmed that "Professor

⁴³ This increase was applied in later decisions to the reproduction right of musical works and sound recordings.

⁴⁴ In its 2005 decision, the Board rejected the Audley-Boyer model in the following terms: "The model is complex, but that in and of itself is not a reason to reject it. It also represents a valid and interesting attempt at evaluating the contribution of music as an input for broadcasters, something which is difficult at the best of times. In theory, then, it could prove helpful in estimating the value of music, something the Board is always striving for in setting tariffs... In practice, however, the model suffers from significant flaws ... The model is inherently imprecise because it is based on a series of unproven assumptions..." (CCB 2005 decision, pages 15-17). It is not useful or relevant to discuss here the CCB's appreciation of the Audley-Boyer model because, although this appreciation is at times if not always improper or incorrect, it can be excused because of both the complexity and somewhat inadequate wording of the original 2004 formulation of the model. The discussion can be more efficiently conducted through the CCB's 2008 re-examination decision.

⁴⁵ In fact, the radio station operators acquire an *access* to the asset represented by rightsholders' repertoire. Hence, one could relate royalties to an access price, as suggested by Strickler (2015). Although Strickler argues in favour of the Baumol-Willig access pricing formula, the case of copyright might more closely be amenable to the Laffont-Tirole Global Price Cap formula (Boyer and Robert 1998).

⁴⁶ In this Appendix, [Bnn] refers to paragraph nn of the CCB 2008 decision. Similarly [Gnn] refers to paragraph nn of the Globerman report.

Globerman ... uses an approach that estimates the overall value of music for radio broadcasters. He assumes that the value of music is equal to the price that would be paid by radio broadcasters for music in a competitive market. In such a market, this price will tend to correspond to the incremental revenue derived from the music, or the value of marginal productivity of music. This in turn can be measured by multiplying the average productivity of music by the price paid by advertisers per hour of music audience” [B55]. The Board summarized the approach in the following terms: “Professor Globerman contends that the value of music to the broadcaster is the product of three main variables: the average productivity of music, the net revenue per hour of music audience and the hours of music broadcast” [B57].

However, the three main variables in Globerman’s model must be carefully measured to derive the competitive value of music. The Board’s account of the measures proposed by Globerman reads as follows: “The average productivity of music is defined as the proportion of total number of hours of music broadcast that is listened to. It is calculated as the ratio of total music listening hours over the total hours of music broadcast. The net revenue per hour of music audience corresponds to the amount of net revenues an hour of listening to the music of a station generates. Professor Globerman calculates this as the difference between total revenues per hour of broadcast and total costs (net of royalties) per hour of music broadcast. The hours of music broadcast measures the total amount of time music is broadcast in a year. The product of the three variables results in the value of music to the broadcasters” [B58].⁴⁷

Globerman recognizes that “the competitive value of the repertoire cannot be directly calculated from the available data” [G28]. Hence, he does not compute directly the competitive value of music, that is, “the price that would be paid by radio broadcasters for music in a competitive market.” More precisely, the measurement of the three underlying variables, the product of which would give us “the value of music to the broadcaster”, is rather done as index values of their average changes over the period 1997 to 2005. The product of those indexes estimates the *change* in the reservation price of broadcasters for music. However, there is every reason to believe that the starting point itself is inappropriate as it does not represent in any respect a truly competitive value.

Strictly speaking, the link between the competitive price and the marginal value of an input is the following: a competitive price results from the interaction of total demand and total supply so that the price appears as given to any participant, buyer and seller; each buyer will choose to buy a quantity such that the marginal value product of the last (additional or marginal) unit of the input is equal to the given competitive price. In that sense, the (given) price of the input and its marginal value are equal.

⁴⁷ The Board adds in the same paragraph: “According to Professor Globerman, this measurement of the value of music corresponds to the maximum amount that broadcasters would be ready to pay for the use of music. He defines this as the reservation price” [B58]. But of course, the competitive value of music and the broadcasters’ reservation price are NOT the same.

Globerman claims, not without reasons, that “Since one typically does not observe very small changes in the use of an input, it is difficult, as a practical matter, to identify changes in the marginal products of inputs. A practical compromise is to focus on average productivity rather than marginal productivity. Average productivity will be a reasonably close approximation to marginal productivity if marginal productivity is, itself, relatively constant over the range of input use being considered, or if only modest changes occur in marginal productivity as input usage is varied.” [G21]

Here Globerman explicitly makes the very strong assumption that the marginal value of music is equal to its average value: “Recall that the competitive price for a ‘marginal’ unit of music is the average productivity of music (assumed equal to marginal productivity) multiplied by the price paid by advertisers per unit (hour) of music audience denoted as P_{am} . The competitive price for the marginal unit is, in this context, the value of the marginal product of music. Total revenue associated with music broadcasting would therefore equal the value of the marginal product of music multiplied by the total hours of music broadcast by radio broadcasters (H_m). In conjunction with the earlier discussion, it can be inferred that a music repertoire is worth more to a broadcaster: 1. the higher the average productivity of music; 2. the higher the price paid by advertisers per unit of music audience; 3. the greater the number of hours of music that the broadcaster intends to program and broadcast. That is, the broadcasters’ reservation price is positively related to these three factors.” [G25]⁴⁸

Economists know very well the numerous pitfalls and biases that a measurement of marginal values by average values may give rise to. Globerman justifies his shortcuts as follows: “the price of an input is, in theory, tied to its marginal product, and average product is used as a proxy for marginal product. Average product will be a relatively good proxy when it approximates marginal product which it is likely to do if average product is relatively constant over anticipated hours of use of the repertoire” [G22]. The justifications offered are clearly very poor. But in any case, Globerman would agree that it is not appropriate to make the assumptions if marginal values can be observed or inferred from the available data.

In the implementation of his model, Globerman relies a lot on simple averages and indexes that unfortunately do not correspond to the analytical concepts, which his calculations are supposed to measure. Simplicity of calculations could be a significant plus (Ockham’s razor or *lex parsimoniae*) if it relies on a sound and well established link between the data and calculations and the analytical concepts embedded in the economic model.

Fortunately, keeping the essential element of Globerman’s model and analysis namely the rightsholders’ repertoire considered as an asset that broadcasters are buying access to, one can take a different route, better grounded in economics, to estimate directly and more

⁴⁸ The middle sentence “Total revenue associated with music broadcasting would therefore equal the value of the marginal product of music multiplied by the total hours of music broadcast by radio broadcasters” is obviously wrong. The total revenue generated by music is the integral under the *mvp(M)* curve.

appropriately the competitive value of music in the HR industry: the Audley-Boyer model as reformulated in Boyer (2015) and represented in Section 1 above.

As shown in Section 1, one needs first the relative use of music expressed as a percentage of total programming time available and second the total payment or compensation paid for program contents other than music. Both the relative use of music and the compensation of program contents other than music are decisions of the HR operators, not opinions of outside observers. Given that those decisions are made in each case to maximize the value or profits of the stations, it is possible to infer from them the value of marginal product of recorded music, hence its competitive value. The data on HR operators' decisions and behavior are readily available from public CRTC and Statistics Canada sources and from the accounting books of commercial radio stations.

It is worthwhile to mention here that if one particular input, such as recorded music, were priced below its competitive equilibrium level, then other inputs, such as direct labor, online personalities, capital, as well as advertisers and end consumers would jointly benefit from capturing the particular input's uncompensated competitive value. Hence the serious potential pitfalls in simply using historical values (as the Board did in 2005 but especially in 2008 on the basis of the Globerman report), which may have been distorted for many years, even decades.

A reformulation: pulling all the strings together

Two important caveats must be repeated again and again as they are often forgotten. First, competitive markets compensate inputs on the basis of their marginal values not on the basis of their total values in the production process. Second, talk may be "more important" than music (in terms of total value) to radio broadcasters even if or when the competitive compensation of music is larger than that of talk. Lots of paradoxes (and analytical errors) flow from forgetting or neglecting these remarkable results.

While the price of music is not known in the absence of a competitive market, the relative use of music is known and easily measured. Economic analysis provides the missing link between on the one hand the measurable relative use of recorded music and other program contents in HR and on the other hand the implicit price of recorded music, not because of some mathematical formula but because this relative use is optimally chosen by HR operators to maximize the value or profits of their respective station.

It is because of the factors and forces underlying the decisions of HR operators that the relative use of music and other program contents reveals so much about the competitive market value of music.

The link between music use and its marginal value, hence its competitive price or market value, can be ascertained without loss of generality through five descriptive economic facts and one simplifying assumption, which are all compatible with the thrust of Globerman's analysis:

- a. Fact #1: a commercial radio operator uses program content inputs, say on-air talent (talk) and music, to generate an audience that is then “sold” to advertisers;
- b. Fact #2: a commercial radio operator aims to maximize the value or profits of his/her station by optimally allocating the limited program time available in different parts of the day between different program contents, say on-air talent and music;
- c. Fact #3: to attain the profit maximizing allocation of program time between the different program contents, it must be true that the marginal (or additional, or incremental) minute of each program content is equal across all program contents. Otherwise, it would be possible and desirable to reallocate the program time from the lower marginal value content to the higher marginal value content in such a way that the profit of the station is increased;
- d. Fact #4: the payments made for program contents other than music is readily observable in HR accounting books;
- e. Assumption #1: the marginal minute of music and other program contents can be programmed at a marginal out-of-pocket cost of zero;
- f. Fact #5: although its marginal cost is assumed to be zero, the opportunity cost of a marginal minute of music and other program contents is positive: using more music means using less talk and vice-versa.

From the perspective of an outside observer of HR broadcasting, the marginal out-of-pocket cost of an additional unit or minute of music is zero as the payment of royalties is not directly tied to the use of music but rather paid as a percentage of revenues: two stations with the same level of revenues but using different amounts of music would pay the same amounts in royalties. And similarly for other program content such as talk for which contracts with on-air personalities are set on the basis of broad characteristics rather than on a per-minute basis. There is therefore no direct link between music use and royalties paid even if music is a generator of revenue and revenue is a generator of royalties.

But the “true” cost of an additional or marginal unit or minute of music is not zero since, given the limited program time available (e.g. fixed at N minutes per hour), it must come at the expense of an equivalent reduction in other program contents. In economics jargon, this is the opportunity cost of the marginal unit of music broadcast: to play one more minute of music, the HR operator must renounce one minute of other program content, say one minute of on-air talent. Sometimes, it is difficult to measure a cost directly while the opportunity cost, based on the value of the renounced alternative, is more easily obtained. This concept of opportunity cost is arguably one of the central and most important concepts in economics.

For simplification, assume that all revenues come from advertising and that there are only two types of program content, namely “music” and “talk or on-air talent”. Let us assume also that the typical relevant part of the day lasts, for example, three hours and that the allocation of

airtime between the different program contents in a given part of the day is done by one-minute increments. To simplify the argument, I will assume that the additional (or marginal) costs to commercial radio operators of a one-minute increment in music content and of a one-minute increment in talk content are both equal to zero since the total payment for royalties is typically set as a *percentage* of revenues and the payment for talk content is typically set on a contract basis with a zero marginal cost within a range of content time.

The total number of minutes of program content in a given part of the day is total broadcast time minus all other items such as station promotion, station identification, advertising, etc. Let us assume for now, to simplify the analysis, that 100 minutes are available on average for program content in a three hour period. The goal of a HR operator is to find the proportion of the 100 minutes to be devoted respectively to music and talk in order to yield the highest value or profit. HR operators will alter the relative allocation of time between music and talk if it is profitable to do so. For example, a broadcaster will devote one additional minute to music, and consequently one less minute to talk (opportunity cost), if the additional advertising revenue associated with the additional music programming, that is, the value of the marginal product of music, offsets any loss of advertising revenue due to the reduction in talk content time, that is, the value of the marginal product of talk.

As in Globerman's analysis, the value of the marginal product of an input "is essentially the increment to revenue that the buyer anticipates from the acquisition and use of an incremental unit of the input to produce output holding the use of other factors of production constant. In a competitive market, the price of an input would equal the value of its marginal product" [G4]. In responding to the market forces created in the advertising market, broadcasters will settle on a particular allocation of time between music and talk such that there is no opportunity to increase revenues by reallocating minutes between music and talk: the allocation of program time chosen by the HR operator must be such that the value of the marginal product of music and the value of the marginal product of talk are equal to each other, say to v .

This result can be compared to what would happen if the market for recorded music and talk contents were competitive markets. As Globerman states: "The value of an input to a potential buyer purchasing that input in a competitive market is determined by the value of the input's marginal product" [G4]. In a competitive market, the HR operator would face prices for recorded music content and talk content, as determined by market forces. Advertising rates for airtime would also be determined by market forces. To maximize the profit or value of the firm, the broadcaster would allocate the available time between music and talk so that the last minute of each type of content generates the same *net* advertising revenue. That is, the additional profit (additional advertising revenue less the additional cost) would be identical for the last minute of music and the last minute of talk at the allocation chosen by the broadcaster. If the HR operator could increase profitability by increasing the amount of time devoted to music relative to talk, the operator would do so. Similarly, if the HR operator could increase profitability by increasing the amount of time devoted to talk relative to music, the

operator would do so. Consequently, the relative amount of time devoted to music and the relative amount of time devoted to talk must be such that their marginal contributions to profits (hence net of marginal costs, if any) are exactly equal.

The value of the marginal product of music and the value of the marginal product of talk must be equal if the HR operator is indeed maximizing the value or profits of the station.

Remember, I am talking of marginal values of music and talk, not of total values or average values; as we saw, even if the marginal values of music and talk must be the same, their total or average values to the HR operator will normally differ, possibly by a large margin. Hence, if the market price per minute of music and the price per minute of talk were both equal to v (defined above), the HR operator would choose the value maximizing allocation of programming time between music and talk, in such a way that the value of the marginal product of music (measured in minutes) would be equal to the market price of music v and the value of the marginal product of talk (measured in minutes) would be equal to the market price of talk v and hence both would be equal as expected.

In the absence of a market for recorded music, the closest surrogate to the *implicit* per-minute price or marginal value product of music content and talk content is the additional or marginal contribution of each to advertising revenues. Given my simplifying but not limiting assumption that the additional cash or out-of-pocket cost of a minute of music and a minute of talk are equal to zero, the additional per-minute contribution of each to advertising revenues must be equal. The tariff rate that approximates the implicit competitive market price for music must therefore be such that the *payments* for the two program contents, music and talk, are *proportional* to their respective numbers of minutes of programming.

As mentioned before, the total contributions to advertising revenues of each type of content (as distinct from the contributions made by the last minute of each type of content) would be potentially much larger than the additional contributions of the last or marginal minute of each program content times the number of minutes of each type of content. The difference serves as in any other context or industry to cover other expenses as well as the cost of capital, that is, the competitive return on the capital invested (the RAROC).

The above analysis does not mean that the pricing (royalty payment) of recorded music is or should be done on a per-minute basis. We know that it is not and should not be. In fact, there are good reasons why the payments to copyright holders should be made as a percentage of revenues for a blanket license, hence at an effective marginal price equal to zero. The main reason is that the short run marginal cost of using additional minutes of recorded music is indeed zero.⁴⁹

But the *implicit* competitive price revealed by the observed behavior and decisions of HR operators remains nevertheless positive and can be used to determine the royalty payments of

⁴⁹ See Boyer and Crémieux (2013), #36-45.

the HR industry to music copyright holders as the competitive value of music to the HR industry. Again, the total value of music to the CR industry is potentially much larger than its competitive value. And again, competitive markets price goods and services and compensate inputs on the basis of their marginal values not of their total values (the basis of the well-known paradox of water and diamond).

Moreover, the competitive royalty payments corresponding to the competitive value of music to the HR industry is arguably much lower than the HR operators' total willingness-to-pay for the music they use, which would correspond to the total value of music for CR, that is, their reservation price for such music use. As Globerman puts it: "... if the Copyright Board wishes to be guided by the workings of competitive markets in its decisions regarding an appropriate tariff, the distinction between a competitive price and the maximum price that buyers would willingly pay should be kept in mind" [G10].

To conclude, the proper interpretation and development of Globerman's analytical framework leads us to the same conclusion as the one presented above: The competitive market value of music corresponds to 28% of revenues of commercial radio stations.

References

- Paul Audley, Marcel Boyer and Stephen Stohn (2004), “The Value of Performers’ Performances and Sound Recordings to Commercial Radio Stations,” a report filed on behalf of NRCC (now Re:Sound) as NRCC-7 for the 2004 commercial radio hearings, Copyright Board of Canada.
- Paul Audley and Marcel Boyer (2007), “The ‘Competitive’ Value of Music to Commercial Radio Stations,” *Review of Economic Research on Copyright Issues* 4(1), December 2007, 29-50 [reprinted in Audhi Narayana Vavili (ed.), *Music Copyrights: A Legal Wrangle*, Amicus Books, 2009; translated in Spanish “El valor competitivo de la musica para las estaciones de radiocomerciales”, In Watt, R. (Ed.), *Teoría econnómica y derechos de autor* (205-244). Datautor, Madrid (2011); and extensively reviewed in the PriceWaterhouseCoopers (Australia) Report, *Valuing the use of recorded music*, July 2008.]
- T. Randolph Beard, George S. Ford, and Michael Stern. 2017. *Safe Harbors and the Evolution of Music Retailing*. Phoenix Center Policy Bulletin No. 41. <http://www.phoenix-center.org/PolicyBulletin/PCPB41Final.pdf>
- Marcel Boyer (2012), “The Economics of Fair Use/Dealing: Copyright Protection in a Fair and Efficient Way”, *Review of Economic Research on Copyright Issues* 9(1), 2012, 3-46., available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2101080##.
- Marcel Boyer (2015), *The Value of Copyrights in Recorded Music: Terrestrial Radio and Beyond*, Commentary #419, C.D. Howe Institute, Toronto, February 2015.
- Marcel Boyer (2018), “The Competitive Market Value of Copyright in Music: A Digital Gordian Knot”, *Canadian Public Policy*, forthcoming.
- Marcel Boyer and Pierre Crémieux (2013), “Measuring Appropriate Royalty Rates in the Presence of Copyright Exceptions,” Copyright Board of Canada, October, 44 pages.
- Marcel Boyer and Anne-Catherine Faye (2018), “Music Royalty Rates for Different Business Models: Lindahl Pricing and Nash Equilibrium”, *Encyclopedia of Law and Economics* (Alain Marciano and Giovanni Ramello, eds.), Springer, forthcoming.
- Marcel Boyer and Jacques Robert (1998), “Competition and Access in Electricity Markets: ECPR, Global Price Cap and Auctions”, pp. 47–74 in G. Zaccour (ed.), *Deregulation of Electric Utilities*, Kluwer Academic Pub.
- Copyright Board of Canada (2014) Decision on “Re:Sound Tariff 8 – Non-interactive and semi-interactive webcasts, 2009-2012.”
- Erin Research (2008), “The Use of Music on Commercial Radio, 2008 Sounds Recordings as Feature Content on Music Stations”, a report filed on behalf of CSI (CSI-03.L), for the 2008-2009 commercial radio hearings, Copyright Board of Canada
- Steven Globberman (2007), “Determining the Appropriate Increase in SOCAN Tariff Payable for the Public Performance of Musical Works,” a report filed on behalf of the Canadian Association of Broadcasters (CAB-6) for the 2007 commercial radio hearings, Copyright Board of Canada

Michael Pelcovits (2006), “Testimony in the Matter of Adjustment of Rates and Terms for Preexisting Subscription Services and Satellite Digital Audio Radio Services”, Docket No. 2006-1 CRB DSTRA, October 2006, 73 pages.

Janko Roettgers, “Why the SiriusXM Investment in Pandora is a Win-Win Situation”, *Variety*, June 9 2017.

David Touve (2015), “\$0.0000955: The value of a Spin, per Listener, to Songwriters on US Radio in 2014”, <https://rockonomic.com/0-0000955-the-value-of-a-spin-per-listener-to-songwriters-on-us-radio-in-2014-bb232821d46f>

David R. Strickler (2015), “Rate Setting for Sound Recordings by the United States Copyright Royalty Board: The Judicial Need for Independent Scholarly Economic Analysis,” *Review of Economic Research on Copyright Issues* 12(1/2), 1-15.

United States Copyright Royalty Judges - The Library of Congress, Determination of Royalty Rates and Terms for Ephemeral Recording and Webcasting Digital Performance of Sound Recordings (Web IV), Docket No. 14-CRB-0001-WR (2016-2020), December 16 2015.

Yoram Wind (2006), “Testimony In the Matter of Adjustment of Rates and Terms for Preexisting Subscription Services and Satellite Digital Audio Radio Services”, Docket No. 2006-1 CRB DSTRA, October 2006, 427 pages.