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**THE THREE-LEGGED STOOL OF MUSIC VALUE:
HERTZIAN RADIO, SIRIUSXM, SPOTIFY**

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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. Striking a proper balance between creators' right to a fair compensation, based on the competitive market value of their works, and users' right to the benefits of digital technologies requires that one can ascertain the competitive value of copyrights as well as the social value of freer dissemination. This paper reviews some of the challenges and pitfalls in adequately framing the issues and proposes an approach to characterizing the proper competitive value of music, inferred from the observation of the behavior and choices of operators of Hertzian radio, satellite radio (SiriusXM), and interactive music streaming services (Spotify). The approach developed leads to clear cut estimates of fair and efficient royalty formulas and payments, compatible with a level playing field of competition between industries and technologies. The estimates derived do not result from ad hoc historical rules, value judgments, or simple heuristics, but are rigorously rooted in advanced economic theory. Those estimates, obtained from three different channels, are relatively convergent and show that rightsholders are significantly shortchanged and poorly served by the current regulatory framework governing the determination of royalties and other form of compensation. A rough but realistic figure of rightsholders' under compensation, as compared to the competitive market value of their works and rights, runs to well over US\$ 1.2 billion per year. This begs the question: How to and who should fill the shortfall?

INTRODUCTION

There is currently an important debate among both academics and professional practitioners on the proper definition, coverage and characterization of intellectual property rights of all kinds: patents, copyrights, trademarks, etc. In many jurisdictions, the legal foundations and enforcement of intellectual property rights are being questioned and reconsidered in the context of the digital era. New laws and extensive revisions of existent laws are discussed with powerful political and business groups on all sides of the debates.

At the center of those debates one finds arguments on the costs and benefits of protecting and enforcing intellectual property rights. The balance of costs and benefits is seen differently by different actors. Some see the costs of such policies, in terms of a lower dissemination of creations and innovations and therefore a loss of socio-economic value, in part in terms of further creations and innovations, as larger than benefits. Others see those benefits, in terms of adequate protection of intellectual property rights allowing proper compensation of creators and innovators thereby inducing them to increase their valuable and significant but risky investments in the production/expression of creations and innovations, as overshadowing costs.

Clearly, intellectual property rights should not be an impediment to further creations and innovations and therefore, should be properly defined and restricted in time and scope. As clearly, creations and innovations do not fall from heaven but are the results of significant efforts exerted and risks taken by creators and innovators. The balancing act here is to provide sufficient incentives for creators and innovators while at the same time foster the dissemination of creations and innovations. This is where market and market-like institutions for transactions on intellectual property rights, including fair use/dealing exceptions, compulsory licensing, as well as administrative boards and tribunals¹ acting as social welfare maximizers or market surrogates, can play a major role.

The recorded music and book publishing industries are particularly important in the digital economy. First, recorded music and books are prone to digitization. Second, new technologies used to sell and distribute music and books on the Internet (webcasting and on-demand streaming, e-books) raise the possibility of valuable large-scale dissemination and customization at relatively low marginal costs. Those technologies open recorded music and book markets to an increased intensity of competition due to the lower costs of entry of creators (authors, composers, performers, writers) on a world-wide and time-wide scale.

Those technological developments raise new risks of copyright erosion and inadequate or unfair compensation of creators. It has become increasingly difficult to affirm and enforce

¹ Such as the US Copyright Royalty Board for sound recordings, the US Rate Courts for musical works, the Copyright Board of Canada for literary and musical works and sound recordings and other similar institutions elsewhere. See the Appendix for a brief survey of the different institutional frameworks of different jurisdictions.

traditional intellectual property rights. And significant challenges pave the way to copyright reforms aimed at reaping the benefits of the digital technologies while protecting creators.

Although the challenges and pitfalls are similar in the literary works and musical works fields, the rest of this paper will deal with music only for reason of simplicity and clarity. But most of it can be read *mutatis mutandis* with literary works in mind.

Copyright comes in many forms: the exclusive right of authors, composers and music publishers to the communication/transmission as well as to the reproduction of their works, the fair compensation right of performers and makers of sound recordings. The communication / transmission and the reproduction of works and sound recordings come also in different forms, depending on the industry considered and the technology used.

The Principles

Three principles are at the forefront of the copyright pricing challenge: First, the competitive level playing field principle, which ensures that all uses of musical works and sound recordings, whether in hard or digital form, compete for customers on equal terms given the various business models characterizing the different users: same pricing for similar uses, different but compatible pricing for different uses; Second, the competitive market value principle, which ensures that the compensation of rightsholders achieve fairness for both users and rightsholders as well as efficiency and effectiveness; Third, the information good pricing principle, which ensures that users can have access if not consume all available musical works given that those musical works are permanent, that is, not expended in consumption.

The Challenges and Pitfalls

The challenges and pitfalls are numerous:

- 1) Moving away from simple heuristics and traditional analysis toward sounder more advanced economic analysis and a renewed institutional framework is a demanding endeavor, which could be miscarried if not properly understood;
- 2) Musical works are *costly* information goods: the creation or production of the first copy may require significant resources of the intellect (human capital) and may be risky, but once created the work can be consumed simultaneously or not by multiple users without depleting the quality or quantity of the good available to any of them;
- 3) Digitization is a drastic innovation that reduces significantly the dissemination costs of music and books, thereby challenging the delicate balance between the creators' right to a fair compensation and the users' right to the benefits of digital technologies, an issue made even more challenging and exacerbating as musical works are “information” goods;

- 4) Copyright made works excludable information goods, thereby favoring the emergence of markets and market-like or market-surrogate institutions, but the excludability level that copyright was supposed to ensure may have become too severe for the digital world, hence socially less efficient and less effective than before; the advent and growth of digital technologies have favored an increase in the value of music, but at the same time put more emphasis on making it more available than before, in a sense reducing the desirable level of excludability;
- 5) The digital revolution comes at a time when the “value” of copyrighted musical works appears to be both significantly underestimated and continuously eroded by new copyright exceptions and limitations;
- 6) The current framework of sequentially determining royalty payments and rates, each case being heard or negotiated on a standalone basis thereby making it difficult for the royalty boards and contracts to implement significant adjustments; if all rates were to be determined at the same time, a level playing field of competition could more easily (!) be maintained with the different rates being based on proper competitive market values; making changes in a sequential fashion may prevent the unavoidable challenges of the status quo;
- 7) There is a real danger of inadvertently tilting the level playing field of competition between different delivery technologies of musical works, namely traditional, analogue, digital, and Internet technologies, which are all competing for listeners’ ears;
- 8) There is also a real danger to lose sight of the forest for the tress, as the big picture itself keeps evolving; as the US Copyright Office (2015) puts it: “The Copyright Office has previously highlighted the outmoded rules for the licensing of musical works and sound recordings as an area in significant need of reform. Moreover, the Office has underscored the need for a comprehensive approach to copyright review and revision generally. This is especially true in the case of music licensing—the problems in the music marketplace need to be evaluated as a whole, rather than as isolated or individual concerns of particular stakeholders.”

The competitive pricing of copyrights in such a context aims to achieve both balance and neutrality between rightsholders’ rights and users’ rights, both business users’ rights and consumers’ 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. Achieving such competitive pricing requires to move away from traditional heuristics toward sounder analytics.

Indeed, the current procedures for determining royalty payments and rates are based mainly if not totally on path-dependent heuristics and rules of thumb whose foundations in theoretical and applied economics are relatively weak and clearly inadequate to tackle the current and upcoming copyright agenda.

The Fundamental Issues and Questions

The fundamental issues or questions before us are the following:

- a) What is or are the competitive market value/values of copyright given the “information good” aspect of copyrighted works (music and books), as the advent of digitization makes the emergence of properly functioning competitive markets difficult, even impossible?
- b) How to balance the creators' right to a fair compensation and the users' right to the benefits of digital technologies, at a time when the conflict between fairness and efficiency has become more acute than ever before?

The competitive market value principle, which is the very foundation of the proper or fair compensation of creators, relies on the consumers' valuation of music and willingness to pay for it. But the ways payments are to be made may not be the traditional ways (tariffs or per play rates). A consumers' advocate economist would say: Although we value music a lot and want to consume more of it and although we want providers of such music to be properly compensated (competitive market compensation), the pricing of such music should take into account the fact that music is an information good or asset and the fact that adding consumers or enhancing dissemination of works cost almost nothing. This calls for a significant reassessment of both the way copyright protection has historically been understood and enforced and the channels through which creators' proper or fair compensation can be achieved. This is at best a difficult multifaceted endeavor, whose end point solution likely lies outside the box.

Section 1. Copyright and the New Digital Economy

With these trends as background, the digital era can be defined as encompassing drastic innovations in the production and distribution or dissemination technologies as well as business organization and governance associated with the digitization of goods and services and the digitalization of firms and businesses.² Their impacts on the competitive landscape of markets, in particular markets for intellectual property products such as copyrighted musical

² The Oxford English Dictionary (OED) traces the first uses of the terms ‘digitization’ and ‘digitalization’ in conjunction with computers to the mid-1950s. In the OED, digitization refers to “the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and text) into digital form.” Digitalization, by contrast, refers to “the adoption or increase in use of digital or computer technology by an organization, industry, country, etc.”

works, is of major importance. All current and past musical works of the world are literally and increasingly becoming available to all at a low if not zero marginal dissemination cost.

The significant reduction of dissemination costs of music poses important challenges for the delicate balance between creators' right to a fair compensation or a fair share of the market value of their works and the users' right to the benefits of digital technologies.

The situation is made even more challenging as musical works are “information goods”: once produced, each unit can be “consumed” by all, as one person’s use (listening or reading) of a work does not prevent its simultaneous or subsequent use by others. Moreover, musical works are assets that survive indefinitely with no physical depreciation. Hence, they are better referred to as “information assets”.

Although related, the “information asset” character of copyrighted musical works and sound recordings and the digital character of music are two different challenging factors in the current copyright landscape. The first one relates to the permanence of the product or asset as my consumption of a unit does not destroy the unit, which remains fully and unabatedly available for everyone else now and in the future, while the second one relates to the distribution or dissemination costs of that product or asset.

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.

Therefore, music streaming is the fast growing segment of the music industry, but people seem reluctant to paying for the service because they know in a sense that the dissemination costs of music are close to zero. Interestingly, the same trends goes on for books and e-books. The Malka Report (see below) lists 21 planned “compulsory” exceptions to EU copyright law. If enacted, they would seriously undermine the capacity of the book publishing industry to pay fair compensation to authors and creators. One of those exceptions for instance would allow libraries to lend e-books without limit of time or number, a serious threat of cannibalization of book and eBook sales and possibly of royalties.

Before the advent of digitization, music and books were information assets whose distribution costs were significant, while those costs are now reduced to almost zero. Marginal distribution

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.

or dissemination costs were possibly sufficiently high to allow profits over variable costs to cover the cost of creation itself through royalties. It may not be the case anymore.

The digital revolution comes at a time when the “value” of copyrighted works appears or is claimed to be both significantly underestimated and continuously eroded by new copyright exceptions, while being challenged by users’ groups among others claiming that a reduction in copyright scope and duration would favor an increase in social and economic welfare as well as a more intensive and extensive development of innovations and creations.

Striking the right balance between creators’ and users’ rights in such a context is a difficult and multifaceted endeavor for all those different reasons. In a nutshell: musical works are *costly* information assets; digital technologies reduce the marginal cost of dissemination or distribution of works to almost zero; copyright made works excludable information assets, thereby favoring the emergence of markets and market-surrogate institutions, but this excludability level may have become too severe for the digital world, hence possibly less efficient at its current level and less effective than before.

The digital era raises significant challenges for the valuation and pricing of musical works. Hence the importance for economic theorists and empirical economists to take a serious look at the paradigm-changing potential that comes from large scale digitization, digitalization, dissemination and customization both to better understand those phenomena and to suggest adequate efficiency-prone policies.⁵

The economics program

Indeed, two important objects of economics as a social science are first the analysis of static and dynamic *mechanisms* that can best contribute to meeting the virtually unlimited needs of human beings with the limited resources available to them, and second the design and characterization of those *institutions* that can implement or concretize those mechanisms. The appropriate welfare-generating production and distribution mechanisms and institutions will depend on the nature and characteristics of the goods and services that citizens and consumers demand or need.

The world of copyright is in deep turmoil. And law and economics questions are raised. Why do we observe an increasing breath, intensity and scope of fair use/dealing exceptions? If fairness in compensation must be based on competitive market compensation, then what is the “competitive market compensation” level in the context of information assets with quasi zero dissemination or distribution costs (digital technologies)? Should fair use/dealing provisions

⁵ The Honorable David R. Strickler of the US Copyright Royalty Board, the institution responsible for the determination of royalty rates and terms for statutory licenses of copyrights on sound recordings, emphasizes the judicial need for continued and comprehensive research in copyright economics in “Royalty 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.

be compensated? If yes, by whom? What about other exceptions? Why not make copyrighted works royalty-free? And if so, how can creators' compensation be assured?

Section 2. The Gordian Knot of Copyright Pricing and Compensation

The most important *general* principles that have been present in numerous if not all decisions of the different copyright boards and authorities are the following: the economic concept of works as information assets, the socio-economic efficiency criteria, the willing buyer willing seller paradigm, the willingness to pay and the ability for the rights by different users, the concept of proxy for an inexistent price and its different forms, and finally the role of the copyright boards and commissions or authorities, under different institutional settings, acting as surrogates of competitive markets and informed negotiations.⁶

How can we define the level of production of or investment in an information asset to ensure not only that the maximum well-being is provided to citizens but also that existing institutions (markets, competition, regulations) will be able to achieve this level of production or investment? It is a complex issue.

For normal goods and services, the optimal level of consumption is generally considered to be the level achieved when the price of the good is equal to its marginal production cost, insofar as demand or total consumption of the good at this price is such that the total net surplus generated, defined as the total value of consumption less the total cost, is positive. Otherwise, it is better not to produce the good in question. Thus the *optimal* consumption level (production, distribution, and dissemination) is either zero or equal to the level obtained with marginal cost pricing. This level corresponds to what economists call a first-best optimum, which requires that fixed costs be covered one way or another. A competitive market is generally the preferred mechanism for defining and achieving an optimal level of production and consumption for normal goods.

With information goods or assets, the problem is somewhat more difficult 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 in question. 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 the unit in question. And additional units should be produced 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

⁶ For more on this set of principles in the context of hearings and decisions of the Copyright Board of Canada, see Marcel Boyer, "The Canadian Copyright Board: Economic Concepts and Principles in Decisions and Arguments", pp. 61-99 in Ysolde Gendreau (ed.), *Copyright Board of Canada: Bridging Law and Economics for 20 years*, Carswell, 2011.

as it implies, when the sum of marginal values is equal to marginal cost, that marginal values across users will differ.⁷

However, for an information good or asset whose marginal cost of distribution is zero or almost zero, under the digital technology revolution, the optimality condition requires that the sum of users' marginal values be equal to zero, which implies that each and every user's marginal value be equal to zero. Clearly, a common price equal to the marginal cost of (re)production will not enable the creator/seller/producer to generate enough revenue, in fact any revenue, to cover all costs involved in generating and marketing the information asset, and in particular the significant fixed costs, including the proper compensation for risk taking.

Indeed, the fact that the same unit of an information asset can be used or consumed by many, at the same time or not, means that the good survives consumption: the marginal cost of adding one user or consumer, or for that reason any or almost any number of additional users or consumers can be done at zero cost, almost forever.

A competitive market, which would implement the condition "price = marginal cost = 0", cannot therefore ensure an optimal allocation of resources unless and until the compensation of fixed costs of production or creation is achieved. With a zero price, too few individuals would be prepared to take up a career as a creator and to devote the time and resources needed to generate zero-priced information assets, namely original musical or literary works.

In response to these problems, two streams of thought have developed. The first argues that one ought to assign property rights to creators over their created assets, in particular over the transfer and reproduction of their creations, and allow markets to emerge and determine equilibrium prices, that is, prices that ensure that creators and consumers/users are satisfied with the exchange or transaction level that would thereby be achieved.

Because of the property right conferred, creators might be able to restrict access to those users or consumers who actually pay for this access. The resulting equilibrium price would be higher than the marginal cost and could make it possible to cover all of the production and distribution costs, at the expense of lower than optimal consumption levels or use levels (second best) of the asset.

The other stream of thought argues that the strict attainment of an optimum must be promoted with transfer, reproduction and consumption allowed at marginal cost, hence free of charge (first best). Creators should then be compensated in various ways from some combination of private sponsorship and grants, concerts with limited admission capacity hence priced above zero, and government subsidies.

Each of these approaches poses problems.

⁷ Achieving the optimality condition through decentralized decision making by would for instance require different prices for different users in order to induce them to consume the proper quantity (, each user thereby facing his own particular price (Lindhal equilibrium). The sum of those individualized prices must then be equal to and sufficient to cover the marginal cost of production.

Overly strict copyright provisions could give the producers of the work a monopoly over the asset, or group of assets if creators can regroup under a common roof: the price of each unit could then be too high and the number of creations distributed or disseminated too low, that is, less than optimal because of the resulting limited access to and distribution of the works, thereby reducing the production of new works as each new work is in some sense the indirect result of previous works: “A dwarf sitting on a giant’s shoulders can see much farther than the giant.”⁸

Free use has its own set of problems. If an organization of private parties or governments had to fund the production of works through fixed or variable grants to creators and to that effect keep a record of every use, how could it establish the absolute and relative value of the works produced in order to properly compensate creators? The organization might want to control its disbursements, reduce them or even link them to arbitrary factors, to the detriment of creators and users. Which and how many authors or creators would spend time and resources to produce quality works whose valuation depends on the goodwill and sagacity of some organization of private parties or government bureaucracies?

Economic analysis can provide or at least suggest answers to these questions. The problem is complex, as Cooter and Ulen (1998)⁹ suggested: “Put succinctly, the dilemma is that without a legal monopoly not enough information will be produced but with the legal monopoly too little information will be used.” Obviously, solutions will not be completely efficient or first-best optimal.

The whole art lies in finding a solution that can be useful and be implemented at low cost while at the same time come close to an optimal allocation. The best that one can hope for would be to regulate market pricing in order to minimize distortions from the first-best solution, that is, to introduce appropriate distortions-minimizing wedges between prices and marginal costs to meet a budget objective, which in the present context takes the form of a proper competitive compensation level for creators.

A combination of the above.

The first-best solution is to price at marginal cost and find other ways than revenues generated from sales to compensate creators, as those revenues will not be sufficient to do so. The second-best solution is to introduce wedges between prices and marginal costs in the different market segments, or at different links in the chain between creators and users or

⁸ Jean de Salisbury (1159), *Metalogicon*, University of California Press (1955 edition), 305 pages: “Bernard of Chartres used to say that we are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size.”

⁹ Robert Cooter and Ulen, *Law and Economics*, HarperCollins Publishers, 1998.

consumers, in such a way that the resulting use or consumption levels allow the proper compensation of creators but diverge as little as possible from the first-best ones.

This can be done through what economists call the “Ramsey inverse elasticity” principle or pricing rule: wedges between prices and marginal costs should be inversely proportional to the elasticity of demand, that is, be higher when demand is less elastic, indicating a low reactivity of users or consumers to price increases. In this way, second-best consumption levels will remain as close to first-best levels as possible given the budget constraint.

One may also think of a combination of the above two solutions: partly first-best principled and partly second-best principled. The problem and its solutions are complex and it is important to remember that as soon as one enters into a realm of solutions that have imperfect and incomplete information bounds or constraints placed upon them, the best becomes the enemy of the good: things gets messy when “you run with the hare and hunt with the hounds.”

What should be the creators’ compensation constraint to impose on the overall pricing system? That is another Pandora’s Box. The historical prices and royalty revenues effectively received by rightsholders are of little help here as they were obtained and developed through self-referencing rate determination procedures and hearings, with little if any theoretically-sound empirical justifications.

It is the competitive market value that provides the compensation constraint to be imposed on the overall pricing system. Since musical works and sound recordings are information goods or assets, the determination of relevant 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.¹⁰ We thus need a more rigorous basis for ascertaining the value of copyrights, that is, the competitive market value of copyright in copyrighted works or assets.

Section 3. The Search for Value: Hertzian Radio

The terrestrial (Hertzian) radio industry has many characteristics that make it suitable to derive or infer the objective market-based value of music copyrights. It is a mature industry with good business data, hence can be analyzed without too many restrictive or outside 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).¹¹

¹⁰ 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.”

¹¹ This section is based on two publications. The first one is Paul Audley and Marcel Boyer, “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”,

Once this value is obtained, one can proceed to determine the competitive market value in Internet non-interactive radio (IR) on the basis of the level playing field principle, that is, on the basis that competition between these two forms of radio, competing for listeners, be engaged on equal terms insofar as the price of music, their critical input, is concerned. We can then extend the analysis to steaming interactive services by using a market proxy for interactivity form the music downloads market.

What is the business of a commercial radio station? We can assume that the objective of a commercial 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. The 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.

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 marginal contribution to profit or station value; otherwise, the operator would change the program mix to get a higher level of profits. Station profit or station value maximization requires that the per-minute marginal value be the same for music and talk. Let us say that happens for the program time split (M^* , T^*), expressed in minutes or percentages of available program time. This implies an *implicit* competitive market price per minute P, the same for both music and talk, that is, if this price or cost per minute of music and talk was in effect, the broadcaster would choose the program mix (M^* , T^*).

Observing the program mix (M^* , T^*) chosen by the broadcaster and the compensation of talk PT^* , available from the accounting data of the radio station, one obtains an implicit competitive market per minute price P equal to the total compensation of talk divided by the number of minutes of talk T^* . The competitive market compensation of music can then be obtained as $PT^*(M^*/T^*) = PM^*$. Hence, the competitive market value of music is revealed by or inferred from the behavior and choices of the commercial radio broadcaster or broadcasters. Hence the following basic proposition:

The competitive market values/compensations of music and talk are necessarily proportional to their “shares” of broadcast time.

The above proposition or theorem has NOT been obtained from a heuristic or historical approach and it is NOT an opinion, a belief, or a value judgement. It follows from (i) the

In Watt, R. (Ed.), *Teoría económica y derechos de autor* (205-244). Datautor, Madrid (2011); and extensively reviewed in the PriceWaterhouseCoopers (Australia) Report, *Valuing the use recorded music*, July 2008. The second publication is Marcel Boyer, *The Value of Copyrights in Recorded Music: Terrestrial Radio and Beyond*, Commentary #419, C.D. Howe Institute, Toronto, February 2015. Available at: https://www.cdhowe.org/sites/default/files/attachments/research_papers/mixed/Commentary_419.pdf

assumption of profit or station value maximization and (ii) two elements of information or observable elements, namely the chosen program mix (M^* , T^*) and the competitive compensation of talk expressed as PT^* determined on a competitive market and willingly paid by the broadcaster.

Two important caveats.

It may be useful to recall some caveats here. First, competitive markets compensate inputs at their marginal values, not at their total values for the firm (buyer), here the broadcaster: hence, competitive market values of music and talk will be as usual potentially much lower than their respective total values for the broadcaster. 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.

An illustrative application based on Canadian data.

To illustrate further the power of the above arguably simple model and analysis, let us consider the data from the Canadian commercial HR industry. The figures are rounded out. Total advertising revenues of the Canadian commercial terrestrial radio industry reaches some 1.6 billion C\$ in 2015. The total music royalties payable by the industry, at the nominal (before deductions) rate of 11.15% of revenues amounts to 180 million C\$; after different deductions are applied, this amount falls to 100 million C\$ or 6% of revenues.¹²

The data to implement the above analysis is readily available from CRTC, Statistics Canada, and the financial reports of the HR operators. As we showed above, we need two pieces of information: the share of programming time allocated to music by HR operators and the programming costs per minute of non-music content.

Based on data obtained in the course of hearings before the Copyright Board of Canada in 2004,¹³ Audley and Boyer (2007) obtained that Talk received about 18.8% of total revenues, which would amount today to about 300 million C\$. They also obtained that music represents on an advertising-weighted average basis at least 60% of program time,¹⁴ hence that (M^* , T^*)

¹² 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.

¹³ Paul Audley, Marcel Boyer and Stephen Stohn, “The Value of Performers’ Performances and Sound Recordings to Commercial Radio Stations,” a report filed on behalf of NRCC now Re:Sound (NRCC-7) for the 2004 commercial radio hearings, Copyright Board of Canada.

¹⁴ The Audley-Boyer estimate is an advertising-price (rate card) weighted share of music across different parts of the day. It is therefore not directly comparable to (but more rigorous than) the other estimates.

= (60%, 40%).¹⁵ Applying the theorem above, the competitive market value of Music amounts to $18.8(60/40) = 28\%$ of revenues, or $300(60/40) = 450$ million C\$.¹⁶ This amount would be larger if we were to consider a larger percentage share of music in program time.¹⁷

We saw above that the total royalties paid by the commercial radio industry in Canada amounts to about 100 million C\$. 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 270 million C\$. If music 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 in the value created by the commercial 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 audiences of particular interest. 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 of 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.

¹⁵ Other sources come to different shares of music and talk through different methodologies applied to different periods, different contexts, and different samples: (70%, 30%) in 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; (81%, 19%) in 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; (81%, 19%) in Copyright Board of Canada (2014) Decision on “Re:Sound No. Tariff 8 – Non-interactive and semi-interactive webcasts, 2009-2012.”; (67%, 33%) in 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> . Touve writes: “Estimating the number of songs played per hour on US Radio appears to be a mix of Art and Science.”

¹⁶ This is inclusive of HR cost of the music programming that is not related to royalties (about 1.9% of revenues).

¹⁷ For instance, if we were using Globberman (2007)’s 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, again inclusive of HR cost of the music programming that is not related to royalties (about 1.9% of revenues).

Section 4. The Search for Value: Satellite Radio

As the terrestrial/Hertzian radio industry, the satellite radio industry has many characteristics that make it suitable to derive or infer the competitive market value of music copyrights. It is a well-developed and established industry with good business data, hence can be analyzed without too many restrictive or outside a priori assumptions. We will see that the available public data allow us to derive a competitive market value of music properly grounded in economics.

What is the business of a satellite radio (SR) provider? We can assume that the objective of a SR provider is to maximize profits or business value by attracting subscribers to its ad-free service and capturing a particular niche audience on its ad-based service to be sold to interested advertisers. The provider achieves this by offering a combination of different genre 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 or business value; otherwise, the SR provider would change the portfolio of genre-specific stations and the program station mix or mixes to get a higher level of profits.

The relevant fundamental proposition from economic theory is that the marginal value of a factor or input is equal to its (marginal) capacity expressed in terms of the additional quantity produced (here the number of additional subscribers/listeners attracted) times the value for the SR provider of those additional subscribers/listeners, that is, the revenue the SR provider can generate from its subscribers/listeners.

In other words, the observed quantity of music used by the SR provider together with its capacity to attract subscribers/listeners as well as the value of those additional subscribers/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/listeners for the firm (the marginal value product of music), the firm would buy or provide the quantity of music it is providing or using. 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 in satellite radio are necessarily proportional to their relative marginal capacities to attract subscribers/listeners.

Again, the above proposition or theorem has NOT been obtained from a heuristic or historical approach and it is not an opinion, a belief, or a value judgement. It follows from (i) the assumption of profit or service value maximization and (ii) the relative capacities of different contents or inputs to generate additional net revenues (their relative marginal value products). The chosen combination of inputs 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 or contents at their marginal values, not at their total values for the firm (buyer), here the SR provider: hence, 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” (Annual Report, page 2).

From the 2015 annual Report (SEC 10-K filing) of SiriusXM,¹⁸ 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

¹⁸ “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.”

our Canadian affiliate and ancillary revenues.”¹⁹ 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 will allow us to determine the competitive market value of music in satellite radio. To do this, we will first consider the nature of the contract SiriusXM signed with its main talk attraction namely host Howard Stern. We will be able to determine what the profitability of this host is for SiriusXM and how this profitability is linked to its compensation. We will then apply the same methodology to determine the value of music to SiriusXM. The data come from the 2006 hearings before the US Copyright Royalty Board and in particular from the October 2006 Report filed by Michael Pelcovits on behalf of SoundExchange.²⁰

The market price the SDARS would pay for sound recordings should be consistent with the market prices paid for other content. Dr. Pelcovits’ analysis of the prices the SDARS pay for other content suggests that a comparable return to sound recording rights holders would be 24.5% of SDARS’ total revenues. Dr. Pelcovits uses one well-defined example of non-music content, about which there is the most information available in the public domain: the amount SiriusXM paid for the right to carry Howard Stern’s programming. The amount SiriusXM paid for Howard Stern and for other content on a per-customer-acquired basis ought to equal the amount SiriusXM would pay for sound recordings on a per-customer-acquired basis.

SiriusXM paid Howard Stern approximately \$415 million in net present discounted value for the rights to carry Stern’s programming for five years. Financial analysts, some of them briefed on the Stern transaction by SiriusXM, generally put the number of incremental customers Sirius expected to gain from Howard Stern’s programming at less than 1.75 million net customers. Hence, SiriusXM paid \$237 per subscriber to Stern for the incremental subscribers (\$415 million divided by 1.75 million subscribers).

Using a 42 month average life for the typical SiriusXM listeners, Dr. Pelcovits calculates that SiriusXM paid Stern about \$5.64 per month for each incremental subscriber (\$237 divided by 42). Sirius 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). SiriusXM paid Stern from 48% ($\$5.64/\11.65) to

¹⁹ 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.”

²⁰ Testimony of Michael Pelcovits *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.

55% (\$5.64/\$10.25) of revenue generated from each subscriber that his programming attracted to SiriusXM. That makes an average of slightly above 50% of revenue.

We learn from the testimony of Yoram Wind (October 2006) on the survey he conducted on SDARS subscribers²¹ that 41% of subscribers to SDARS would drop the services if there were NO music and 15% more would be willing to pay an average reduced price of 7.27\$ per month, that is 44% less than the regular price of 12.95\$ per month. If SDARS were to drop their price to 7.27\$ per month for all 59% of subscribers still on board, revenues would drop by 67% (41% + 59%*44%). If SDARS maintained their price at 12.95\$ per month, then 56% (41% + 15%) of customers would drop the service and revenues would therefore drop by 56%. Hence the second alternative would be better and therefore, one can conclude that music generate 56% of subscribers to SDARS or in others words that SDARS would lose 56% of subscribers if no music were offered.

If music content were to receive 50% of the revenue for the 56% of those customers attracted to the SDARS by music, it would receive 28% (50% x 56%) of the revenue associated with all of the SDARS' customers. In other words, based on what SiriusXM paid for Howard Stern's programming, one would expect music content to receive, in a similar marketplace transaction, approximately 28% of revenue for use of its licenses.

In sum, if SiriusXM paid the sound recording owners an amount comparable to what it paid Howard Stern in an open marketplace transaction, it would pay approximately 24.5% of revenues to SoundExchange and another 3.5% to music publishers. With revenues of US\$4.57 billion in 2015, this would represent US\$1.28 billion in royalties, Given that SiriusXM paid 10% of revenues (US CRB PSS-SDARS decision 2012) in royalties that year, the missing value due to rightsholders amounts to US\$823 million in 2015.

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 commercial HR industry, we can regroup those into five different groups: the music content providers, the talk content providers, the owners, operators, managers, capital providers, workers, employees, materials and equipment suppliers, etc., the advertisers, and the end consumers as subscribers/listeners and their governments as their collective representatives. Those stakeholders collectively account of the value created by but not captured by rightsholders, but again it is not clear who captures what share of the missing competitive market value of music.

²¹ Testimony of Yoram (Jerry) Wind *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 (Appendix K, Figures 1 and 2).

Section 5. The Search for Value: Interactive Music Streaming Services

The interactive music streaming services industry has characteristics that make it suitable to derive or infer the objective market-based value of music copyrights. It is an unregulated industry with sophisticated buyers and sellers of licenses for accessing musical works and sound recordings and with good business data, hence can be analyzed without too many restrictive or outside a priori assumptions. This industry is in a sense simpler than commercial HR industry and the SR industry because there is only one content namely music, but that simpler structure may make it more difficult to infer the competitive market value of music from market data in the interactive music streaming services industry. We will show that it is nevertheless possible to do so.

What is the business of an interactive music streaming service? We can assume that the objective of an interactive music streaming service provider is to maximize profits or the service value by attracting subscribers. The provider achieves this by offering a freemium service, that is, basic features are free with advertisements, while additional features plus improved streaming quality and offline music downloads are available with paid subscriptions giving access to a large repertoire of sound recordings embedding musical works with significant flexibility left to subscribers to choose his or her preferred musical works and artists.

The crucial challenges are then to negotiate with music labels the acquisition of the largest possible repertoire at the lowest possible cost and to price its services given the characteristics of other offerings of music on the market. Given that an interactive music streaming service is simply repackaging/reselling music, sound recordings embedding musical works, the revealed competitive market value of music is directly obtained through the financial data of the service provider, the service production function being quite simple.

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

The above proposition or theorem rests on the relatively competitive negotiation process in place between major sophisticated players or agents on both sides of the transaction namely the interactive music streaming services and the music labels and other rightsholders' representatives. The proposition has not been obtained 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 and Pandora.

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 “competitive” given its specificities in the OMS industry and the presence of active and sophisticated competitors on both sides of the transactions. Let us consider the data from Spotify and compare them with data from the semi-interactive 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.²² 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 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 # and % 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.

Pandora²³ is primarily a semi-interactive 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).²⁴ Pandora claims 20 billion listener-hours.²⁵ 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.

²² Data on Spotify obtained from *Music Business Worldwide* (Tom Ingham, May 23 2016), based on Spotify’s financial filing in Luxembourg uncovered by MBW, as reported at: <https://www.musicbusinessworldwide.com/spotify-revenues-topped-2bn-last-year-as-losses-hit-194m/>

²³ Pandora, U.S. SEC 10-K filing for 2016 <http://investor.pandora.com/Cache/38090352.pdf>

²⁴ 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.

²⁵ About the same as total listener-hours to music-format radio stations in Canada, of which recorded music account for 65.7%.

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 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 1.92.²⁶ Hence, the equivalent non-interactive or semi-interactive per play rate of 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.

This indicates that if Spotify per play rate paid in 2015 corresponds to the 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 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.

This undervaluation of music on Pandora semi-interactive streaming service is most probably due to the regulatory institutional framework that rules royalty 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, etc., the advertisers, and the end consumers as subscribers/listeners and their governments as their collective representatives.

Section 6. 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 good, buyers would compare the (marginal) utility or value derived from the use of the good to the market price and buy only if such value is larger than its price. Similarly, the sellers would compare the (marginal) cost of producing

²⁶ See Marcel Boyer, Joel Blit and Paul Audley (2013), "The Value of the Use of the CSI Repertoire by Online Music Services," a report filed as Exhibit CSI-3 in the case CSI Online Music Services (2011-2013), SOCAN Tariff 22.A – Online Music Services (2011-2013), SODRAC Tariff 6 – Online Music Services, Music Videos (2010-2013), Copyright Board of Canada.

and making the good to the market price and agree to produce and sell 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, 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.

However, as mentioned above, musical works are different from standard goods like apples or cars; they are information goods. Information goods have the particularity that they can be consumed simultaneously by multiple users without depleting the quality or quantity of the good available to any of them.²⁷ 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 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 listeners' ears.

In HR industry, 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 or webcasting services industry, costs of entry are relatively low while fixed and marginal costs of audience reach (bandwidth costs) are relatively high and increasing with audience size. This favors a per play rate formula. Hence, a royalty formula expressed as a percentage of revenues is socially efficient for HR and SR and a royalty formula expressed as a per play rate is socially efficient for interactive and semi-interactive music streaming or webcasting services.

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. Per play rates in webcasting and music streaming services allow rightsholders to avoid being "residual payees" and favor healthy competition by eliminating uncompetitive webcasters

²⁷ Despite this particularity, the same fundamental principles apply. However, two possibilities arise: either users pay the same price regardless of the value they derived from the work or users pay in some proportion to the value they draw from the good. The latter case is referred to as Lindahl pricing.

who use huge amount of recorded music with little revenue generating capacity, reducing destructive competition intensity (Bertrand trap), and inducing webcasters, as resellers of recorded music, to develop value added features such as the interactivity (Spotify) or genomic features (Pandora).

In Sections 3, 4 and 5, 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 3 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 4 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 5 that for interactive online 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 and adjusted for 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 semi-interactive 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 / users, not from value judgments, and point to a similar competitive market value!

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. Although we do not have the number of plays 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, mentioned in footnote 25) to 0.324 C¢/play (based on the

average of five different reports, mentioned in footnote 25 and 26).²⁸ These per play rates can be directly compared to rates paid by non-interactive or semi-interactive music streaming services. We showed above that semi-interactive 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 HR and SR rates, before adjusting for the exchange rate, considering that those rates are regulated on different bases with different methodologies by different authorities.

As for interactive music streaming services, the above rates must be adjusted upwards for the value of interactivity (+92% from music downloads), 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.²⁹

General 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 may be qualified as significant. In the Canadian HR radio industry, the competitive market value of music is 4.5 times larger than the current level of royalty payments: 28% versus 6% of revenues. In the US SR industry (SiriusXM), the competitive market value of music is 2.8 times larger than current royalty payments: 28% of revenues versus 10%. In non-interactive webcasting (Pandora), the competitive market value of music is about 27 % larger than current royalty payments: 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 is by definition at the proper level (0.600 US¢/play), 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 market value level compatible with a level playing field of competition among industries and technologies.

²⁸ Given that the Canadian HR industry currently pays 100 million C\$ per year (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 (AVG5 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.

²⁹ A note on YouTube (Google) may be useful here. According to the Recording Industry Association of America (RIAA), which represents the major music label companies, YouTube pays 0.1 US¢/play in royalties (<https://medium.com/@RIAA/2016-a-year-of-progress-for-music-4e9b77022635>). YouTube claims that it is advertising-based and therefore more comparable to Hertzian radio than to subscription-based interactive webcasting. Recall that the Canadian Hertzian radio industry pays about 0.045 C¢/play (or 0.035 US¢/play) while Spotify pays 0.6 US¢/play (the RIAA claims that Spotify now pays closer to 0.7 US¢/play) and Pandora pays 0.245 US¢/play.

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 or business value maximization as the objective of users/operators and observed behavior and choices of users/operators.

This begs the questions: Where are the missing values? If Governments and their 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?³⁰

One must exert care, prudence and diligence in generalizing the results of Sections 3, 4 and 5 across different jurisdictions and industries as copyright structures differ across jurisdictions. But the methodologies followed to characterize the competitive market value of copyrights in music could be used first to discover and unveil the appropriate data and also to derive credible estimates.

³⁰ This question is tackled in Marcel Boyer, "The Future of Copyright in the Digital Ear: The Discovery of Copyright Value" (forthcoming, 2017).