

UNITED STATES COPYRIGHT ROYALTY JUDGES  
The Library of Congress

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*In re* :  
 : Docket No. 14-CRB-0001-WR  
 DETERMINATION OF ROYALTY RATES AND : (2016 – 2020)  
 TERMS FOR EPHEMERAL RECORDING AND :  
 DIGITAL PERFORMANCE OF SOUND :  
 RECORDINGS (WEB IV) :  
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**REBUTTAL TESTIMONY OF TODD D. KENDALL**

**I. QUALIFICATIONS**

1. I am a Senior Vice President of Compass Lexecon, a consulting firm that specializes in the application of economics to a variety of regulatory and legal issues. Prior to joining Compass Lexecon in 2008, I served for five years on the faculty of the economics department at Clemson University, and taught in the undergraduate, professional, and economics Ph.D. programs at that university. I have published approximately a dozen articles in academic economics journals and collected volumes on applied economic theory topics, and which employ statistical and econometric methods. Many of these articles focus on the effects of the internet and other new media on various economic and social outcomes.

2. I have been employed at Compass Lexecon since 2008, during which time I have consulted on a wide range of regulatory, litigation, merger, and other business matters. I received a bachelor’s degree in mathematics from the University of Chicago in 1998 and a doctorate in economics from the University of Chicago in 2003. I am a member of the American Economic Association. A copy of my curriculum vitae is attached as Appendix A to this report.

**II. BACKGROUND AND SUMMARY OF OPINIONS**

3. I was asked by counsel for iHeartMedia, Inc. to analyze the effect of listening to an online streaming music service on music purchases. I understand that some participants in this proceeding have argued that listening to certain types of streaming music services promotes music sales.<sup>1</sup> I also understand that witnesses for SoundExchange have argued, however, that listening to streaming music services may substitute for music sales in some cases.<sup>2</sup> Moreover, one of SoundExchange’s economic experts, Prof. Daniel L. Rubinfeld, proposed using royalty rates for “interactive” (or on-demand) webcasting services as a benchmark for setting the statutory royalty rate.<sup>3</sup> Such an approach could lead to biased conclusions regarding the appropriate statutory rate if the net promotion effects of these interactive services are dissimilar to the net promotion effects of non-interactive services that operate under the statutory license.<sup>4</sup>

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1. All citations to testimony hereafter refer to testimony given in this proceeding, unless otherwise noted. *See, e.g.*, Testimony of Robert Pittman, Chief Executive Officer of iHeartMedia, Inc., October 6, 2014, at ¶10 (“The free advertising that radio provides to artists and labels has been valued at billions of dollars per year”); Testimony of Tom Poleman, President of National Programming Platforms, iHeartMedia, Inc., October 7, 2014, at ¶8 (“When listeners hear a song they like on the radio, it fosters their interest in buying it.”); Written Direct Testimony of Timothy Westergren (On behalf of Pandora Media, Inc.), October 6, 2014, at ¶21 (“we are without question promotional of record sales”); Written Direct Testimony of Johnny Chiang (On behalf of the National Association of Broadcasters), October 7, 2014, at ¶5 (“Record companies depend on radio airplay to promote and sell their music.”)
  2. *See, e.g.*, Corrected Testimony of Dennis Kooker, President, Global Digital Business and U.S. Sales, Sony Music Entertainment, October 6, 2014, at p. 20 (“Any promotional effect statutory services might have is insubstantial compared to the substitutional effect that streaming is having on sales of recorded music”); Testimony of Aaron Harrison, Senior Vice President, Business & Legal Affairs, Global Digital Business, UMG Recordings, Inc., at ¶11 (“our observations of the market, especially over the last year, have been that these services are drawing consumers and revenue away from the sale of permanent downloads and CDs”).
  3. Corrected Testimony of Daniel L. Rubinfeld, October 6, 2014, at ¶18.
  4. Prof. Rubinfeld appears to have recognized that promotion effects could limit the usefulness of interactive royalty rates as a benchmark, but stated that “[s]imply put, the notion of promoting sales of music is quickly becoming an anachronism.” *Id.*, at ¶161.

4. To address these issues empirically, I directed the analysis of a large data set that follows 10,000 internet users, tracking their online music listening and digital music purchases over a six-month period in 2014. These data are described in more detail below, but they track listening to the major streaming services, including those that are primarily interactive (*i.e.*, on-demand), such as Spotify and Rhapsody, and those that are primarily non-interactive (*i.e.*, radio-like), such as Pandora and iHeartRadio. I also compared the results indicated by these data with other available evidence addressing similar issues.

5. By analyzing consumer behavior directly, this study can provide evidence on questions of promotion and substitution between online music streaming and music purchases. Specifically, analyses of these data indicate the following principal conclusions:

- As a general matter, increased listening to an online music listening service is positively associated with increased music sales by the same individual, consistent with a conclusion that these services promote music purchases more than they substitute for them; and
- Increased listening to non-interactive music listening services is far more strongly associated with increased music sales than is listening to interactive services. I considered various ways to estimate this differential promotion effect, but in all cases, the additional music sales associated with non-interactive listening are more than 15 times larger than the additional music sales associated with interactive listening.

6. The remainder of this testimony elaborates on these conclusions in more detail.<sup>5</sup>

Appendix B provides a list of materials relied upon in the preparation of this report.

### **III. DESCRIPTION OF DATA**

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5. I was assisted in preparing this report by members of Compass Lexecon's professional staff. Compass Lexecon is being compensated for my time at an hourly rate of \$795, and for the time of others assisting me at their normal hourly rates.

7. The primary data set analyzed in this report was purchased from [REDACTED]  
[REDACTED]  
[REDACTED].<sup>6</sup> [REDACTED]  
[REDACTED]  
[REDACTED].<sup>7</sup> [REDACTED]  
data have also been widely used in academic research relating to consumer behavior online,  
including in the [REDACTED]  
[REDACTED].<sup>8</sup> These studies have found that [REDACTED] data are reliable and consistent with  
other available evidence on online activity.<sup>9</sup>

8. Data were purchased from [REDACTED] that track 10,000 “machines,” *i.e.*, PCs,  
over a period of six months covering March to August 2014, for a total of 60,000 observations.<sup>10</sup>  
The [REDACTED] data do not track mobile devices, and I understand that no comparable data for  
mobile devices are available from [REDACTED]. For each machine and each month,  
[REDACTED] provided information on the use of that machine to listen to each of the major  
interactive and non-interactive services, including specifically the services listed in Exhibit A.

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6. I understand that, pursuant to the terms of the contract under which these data were obtained, the identity of the data source is being marked RESTRICTED under the protective order.

7. [REDACTED]

8. [REDACTED]

9. [REDACTED]

10. It appears that [REDACTED]  
[REDACTED], which may mean that this analysis understates the full promotion effects of online music streaming services over the full course of a year.

Exhibit A also reports the share of machines among the 10,000 sampled that was used to listen to each of these services at least once during the six-month duration of the sample.<sup>11</sup>

9. The 14 interactive services included in [[REDACTED]] data include 10 of the 13 interactive services considered by SoundExchange’s expert, Prof. Rubinfeld, in his analysis of interactive royalty rates.<sup>12</sup> These 10 services cover more than 95 percent of the interactive performances considered by Prof. Rubinfeld in his analysis. The data also include nine non-interactive services, including what industry analyst firm Triton Digital ranks as the two largest non-interactive webcasters (Pandora and iHeartRadio), along with another large non-interactive webcaster, iTunes Radio.<sup>13</sup>

10. For each of these services, [[REDACTED]] provided information on the duration of listening during a given month occurring through each machine, either through the service’s website, or if applicable, its desktop application (“app”).<sup>14</sup> [[REDACTED]] also linked these data with digital music purchases performed using the same machine in the same month. In particular, the data report the number of song purchases from the iTunes Store associated with

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11. For the purposes of this analysis, most services are classified as “interactive” or “non-interactive” using the same classification as SoundExchange’s expert, Prof. Rubinfeld. Testimony of Daniel L. Rubinfeld, at ¶16. In the cases of a few services not considered by Prof. Rubinfeld, I made my own judgment. I classified these additional services as interactive if they appeared to offer substantive ability to access music on-demand, and otherwise classified them as non-interactive.

12. [[REDACTED]] SNDEX0051684\_Restricted.xlsx.

13. Triton Digital (2014) “November 2014 Top 20 Ranker,” February 5, 2015. <http://www.tritondigital.com/press-releases/triton-digital-releases-november-2014-top-20-ranker>. It appears that many of the other services listed by Triton are also included in the [[REDACTED]] data because they stream through iHeartRadio or through TuneIn.

14. Duration of listening for a service’s desktop application is defined as the total time that an app is open on a user’s desktop, and the computer is not in hibernation mode, screen saver mode, or similar. Duration of listening for a service’s website is defined as the total time that a browser window is open, and the user has interacted with the website within the last 30 minutes. For iTunes Radio, Google, and Amazon, the data track use of websites that are used to access these services, but not necessarily all the time listening to these services or access directly through these services’ desktop applications. Analyses intended to test the robustness of the results to exclusion of these three services are discussed below.

that machine, and the number and dollar value of music purchases from Amazon.com associated with that machine.<sup>15</sup>

11. Because I was primarily interested in the purchasing behavior of consumers who listen to online streaming music services, the data purchased from [REDACTED] included 8,000 machines that were used to listen to at least one of these streaming music services or to a major online video service providing music content during the six-month sample period. These 8,000 machines were selected at random by [REDACTED] from among all machines that [REDACTED] tracks and that were used to listen to these services during the sample period. The remaining 2,000 machines reflect an additional sample of machines that were used to purchase digital downloads of music during the six-month sample period.<sup>16</sup>

12. In addition to the information described above regarding online music listening and music purchasing behavior, [REDACTED] also provided, for each machine and each month, the amount of time the machine was used to visit certain “music interest” sites. These sites are listed in Exhibit B. Examples include azlyrics.com, a prominent music lyrics website, and Billboard.com and RollingStone.com, the online versions of the well-known music-focused

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15. In order to convert the iTunes and Amazon data into total measures of songs purchased and dollars spent, the following methodology was used. The [REDACTED] data for the iTunes Store report the number of tracks sold, and an average \$1.29 price per track was assumed. The [REDACTED] data for Amazon.com report purchases in total dollars and number of items, but do not separately group these items into albums and songs. If only one unit is purchased, and reported sales are \$1.29 or less, it was assumed to be a track (single). If reported sales are above \$1.29, it was assumed to be an album. If two units were purchased, and the units’ average price was above \$1.29, then it was assumed that one unit was an album, and the other unit was a single. Otherwise, both units were assumed to each be a single. For three or more units, if the average unit price was \$1.29 or less, each unit was assumed to be a single. If the average price was more than \$11, each unit was assumed to be an album. If the average unit price was between \$1.29 and \$11, it was assumed that one unit was an album, and all other units were singles. The results presented below do not change substantially if all units of any price are assumed to be singles. To convert albums to tracks / songs, it was assumed that an average album contains 12 songs.

16. These 2,000 machines in some cases may also have listened to online streaming services (and would be recorded as having done so in the data), but they are not in any case duplicates of any of the 8,000 machines selected on the basis of listenership.

publications. Consumers typically do not hear or purchase music directly at these sites, but they provide a measure of a listener's broader interest in music.

13. Exhibit C summarizes means and standard deviations for the key variables in the data. The average total monthly listening time to any streaming service is 117.64 minutes per machine across the entire sample. The data indicate greater use associated with interactive services than with non-interactive services. These data include machines that did not record any listening (or only minimal listening) to an online streaming service; among those machines that did listen more than 90 seconds during a particular month, average listening time is obviously higher. Machines in our sample spend an average of 662.05 minutes per month on YouTube (though not necessarily for music), and 3.14 minutes per month on the music-listening sites. The average monthly digital music purchases per machine are 0.98 songs or \$1.26.

14. These data likely understate the amount of music purchasing that is generated by users of music streaming services for a number of reasons. First, I am unable to measure lagged promotion effects, such as a person who hears a song during the sample period and as a consequence buys the song (or another song by the same artist) after the sample period ends. Second, I am unable to observe non-digital download music purchases, such as purchases of CDs. Given my conclusion that streaming services have a net promotion effect on digital purchases, it seems likely that some net promotion effect on physical purchases also occurs, but it cannot directly be measured.<sup>17</sup> Third, I also do not observe (a) digital download music purchases from sources other than Amazon and iTunes, (b) digital download music purchases an

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17. During the first half of 2014, total music sales in physical formats were \$898 million, while permanent digital download sales were \$1.3 billion. Joshua P. Friedlander (2015) "News and Notes on 2014 Mid-Year RIAA Shipment and Revenue Statistics," RIAA, <http://riaa.com/media/1806D32F-B3DD-19D3-70A4-4C31C0217836.pdf>.

individual makes on other devices besides the specific machine tracked by [[REDACTED]], or (c) other sources of copyright holder revenue, such as concert tickets or album-related merchandise. To the extent that webcasting promotes these other sales, this analysis will understate the full promotion value of webcasting.

#### **IV. ANALYSIS**

15. If online music listening affects music purchasing behavior, it should be the case that people who listen more buy a different amount of music than people who listen less. The key empirical complication with such a framework is that there are likely to be other factors that affect both an individual's listening time and his purchasing, such as personal taste for music and income. It is therefore necessary to control for those factors in analyzing the effect of online music listening on music purchasing. For this reason, the analysis was performed on a machine-by-machine basis, using only the variation in listening and purchasing over time for the same machine to evaluate promotion and substitution effects. The econometric term for this approach is a "fixed effects" model, and it effectively controls for every characteristic associated with a given user that does not change during the six-month sample period.<sup>18</sup> For instance, if women tend to buy more music than men, the effect of gender would be controlled for in the analysis because a person's gender does not change during the sample period. Similarly, the fixed effects effectively control for many other factors, including income, race, number of children, education level, and so on.

16. The fixed-effects approach used here therefore analyzes how an individual's music purchasing behavior changes when the amount of listening changes, controlling for all

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18. William H. Greene (2012) *Econometric Analysis*, 7th Ed., Prentice-Hall, at 359-70.



individual-specific factors that do not change over time. I also considered the possibility that there may be certain other factors that (unlike gender) do change over time for the same individual and which may affect both music listening and music purchasing. To help control for these factors, the model also includes: (a) the amount of time spent visiting the music interest sites listed in Exhibit B, and (b) the amount of time spent watching YouTube, which is also tracked in the [REDACTED] data. To the extent some other unobservable factor generated an especially high or low interest in music for an individual in a particular month (such as a change in the individual's amount of free time), that factor would be controlled for in the analysis to the extent the temporarily high (or low) interest in music was also reflected in more (or less) time spent at these other music interest sites and/or more (or less) time spent on YouTube.

17. The econometric model estimated was:

$$[1] \quad \ln(Y_{it}) = \alpha + \beta \ln(L_{it}) + \sum_t \gamma_t M_t + \sum_i \delta_i P_i + \mu \ln(X_{it}) + \varepsilon_{it},$$

where:

- $Y_{it}$  is a measure of music purchases for machine  $i$  in month  $t$ . In separate specifications, the analysis defines  $Y_{it}$  as both the number of songs purchased and the total dollars spent.
- $L_{it}$  is the total number of minutes spent listening to streaming music sites for machine  $i$  in month  $t$  (only machines that listened more than 90 seconds during the month are counted).
- $M_t$  is a set of dummy variables that take a value of 1 if the observation is for a particular month  $t$ , and zero otherwise. These variables control for general changes in music purchasing affecting all users in the sample (such as the possibility that people buy more music during certain months).
- $P_i$  is a set of dummy variables that take the value of 1 if the observation is for a particular machine  $i$ , and zero otherwise. These are the machine fixed effects discussed above.

- $X_{it}$  is a vector with two additional control variables for machine  $i$  in month  $t$ , namely the amount of time spent on the music interest sites listed in Exhibit B and the amount of time spent on YouTube.
- $\varepsilon_{it}$  is a random error term.

## **V. Results**

18. The model in equation [1] was estimated using least squares regression, with standard errors clustered within a given machine.<sup>19</sup> The clustering allows for the possibility that random factors affecting purchasing behavior for the same machine over time are correlated with each other. The first two columns of Exhibit D report the results of this analysis. The numbers in the Exhibit reflect the estimated coefficients in equation [1]. The first column uses the total dollar value of purchases as the dependent variable,  $Y_{it}$ , while the second column uses the total count of songs purchased.

19. Because the listening variable and the purchasing variable are both entered in natural logs, the coefficients can be interpreted to a near approximation as percentage changes. In particular, the results show that a 10 percent increase in listening to any type of streaming music service is associated with between a 0.043 percent and a 0.046 percent increase in purchasing. This effect is statistically significant at the 5 percent level.<sup>20</sup>

20. A separate model was also run to estimate the disaggregated effects of listening to interactive and non-interactive services separately, to determine whether these different types of

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19. The “xtreg” command in Stata was used, as recommended for samples with low numbers of within-cluster observations (six per cluster in this case) in A. Colin Cameron and Douglas L. Miller (2015) “A Practitioner’s Guide to Cluster-Robust Inference,” *Journal of Human Resources*, Spring (forthcoming).

20. In other words, if in fact (contrary to these findings) there was actually no relationship between listening and purchasing (or a negative relationship), the probability of incorrectly concluding from the data that there was a positive relationship (as these findings indicate) is less than 5 percent.

online streaming services have different relationships with purchasing. This model is based on a slightly altered version of equation [1], as indicated below:

$$[2] \quad \ln(Y_{it}) = \alpha + \beta_1 \ln(L_{it}^{INT}) + \beta_2 \ln(L_{it}^{NON-INT}) + \sum_t \gamma_t M_t + \sum_i \delta_i P_i + \mu \ln(X_{it}) + \varepsilon_{it}.$$

21. In equation [2], all variables are defined as before, except that  $L_{it}^{INT}$  reflects listenership only to interactive services, and  $L_{it}^{NON-INT}$  reflects listenership only to non-interactive services.

22. The results from estimation of equation [2] are reported in the last two columns of Exhibit D. The results show that a 10 percent increase in listening to a non-interactive service is associated with between a 0.066 percent and 0.070 percent increase in purchasing, and as before, this effect is statistically significant at the 5 percent level. By contrast, the coefficient on interactive listening is much smaller, and cannot be statistically distinguished from zero – *i.e.*, no net promotion effect at all – at a 5 percent significance level.

23. Importantly, the conclusion that the net promotion effect from non-interactive services is larger than that from interactive services is independent of the conclusion from the previous estimate of equation [1], that online music streaming services as a whole have an overall net promotion effect. In other words, even if there were some unobserved factors that changed for the same individual over time in a way that might bias the estimates of equation [1], the difference between the estimated effects of interactive and non-interactive listening in equation [2] would only be biased by this factor if it was related to interactive and non-interactive services in different ways. Absent such a factor, the conclusion that non-interactive services have a larger promotion effect would remain unchanged.

24. One issue with the [REDACTED] data is that the data for three of the services (iTunes Radio, Amazon Prime Music, and Google Play) reflect time spent on websites that can be used to access streaming music listening, but which also can be used to access sites where music is sold. This raises the concern that the data may in some cases conflate listening on these sites with music purchasing. Therefore, as a check on the results in Exhibits D, the same models were estimated, but excluding iTunes Radio, Amazon, and Google. Those results, which are reported in Exhibit E, are qualitatively similar to those reported in Exhibit D, although they are quantitatively smaller. Excluding these three sites, a 10 percent increase in listening to any streaming service is associated with between a 0.028 percent and 0.029 percent increase in purchasing behavior. A 10 percent increase in non-interactive listening is associated with between a 0.032 percent and 0.034 percent increase in purchasing behavior. Both the effects of listening to any streaming service and listening to a non-interactive service remain statistically significant at the 5 percent level. It is also still the case that the estimated effect of interactive listening on music purchases is smaller and statistically indistinguishable from zero at the 5 percent level. The quantitatively smaller effects for non-interactive listening in this specification could reflect, as noted above, conflation of purchasing and listening behavior in the [REDACTED] data, but they may also reflect that iTunes Radio is more promotional than some other webcasting services. I understand that, in negotiating a direct license with major record labels, iTunes Radio specifically represented to record labels that its service would be substantially promotional in driving iTunes Store purchases.<sup>21</sup>

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21. See, e.g., SINDEX0126392 ([REDACTED])

VI. INTERPRETATION

25. The results above are consistent with a conclusion that listening to a non-interactive service has a net promotion effect on music sales. This section quantifies that effect by translating the percentage effects estimated by the regressions above into dollars per performance.

26. The calculations for non-interactive services are summarized in Exhibit F. First, the average monthly time spent listening to a non-interactive service was calculated (among those who listened to a non-interactive service for more than 90 seconds in a month). This value is 0.62 hours. In testimony submitted in this proceeding, Pandora has estimated that, during 2014, its listeners heard, on average, [REDACTED] performances per hour.<sup>22</sup> The calculations in Exhibit F assume that this is a reasonable representation of the number of songs played per hour on non-interactive webcasting services generally, although it likely overstates the number of performances per hour for simulcasters.<sup>23</sup> If the number of performances per hour were reduced, the implied promotion effect per performance would increase. However, using the [REDACTED] performances per hour figure, a 10 percent increase in non-interactive listenership would generate [REDACTED] additional performances.

27. Next, the average monthly dollar value of music spending on iTunes and Amazon downloads was calculated among non-interactive listeners, which was \$1.55. The estimated coefficient from the third column of Exhibit D indicates that a 10 percent increase in listenership

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22. Written Direct Testimony of Carl Shapiro, at p. D-3 (indicating [REDACTED] ad-supported tracks and [REDACTED] subscription tracks, and further indicating [REDACTED] ad-supported listener hours and [REDACTED] subscription listener hours).

23. I understand that simulcasters typically play fewer songs per hour due to more advertising and other programming, such as DJ announcements.

is associated with a 0.07 percent increase in music purchasing. At the mean, this corresponds to an increase in music spending of \$0.0011 ( $= \$1.55 \times 0.07$  percent). Therefore, since a 10 percent increase in listenership corresponds to [REDACTED] performances, the estimated promotion effect for non-interactive services is [REDACTED] per performance ( $= \$0.0011 / [REDACTED]$ ).

28. This estimate of the promotion effect per performance for a non-interactive service corresponds fairly closely to the results of a controlled field experiment performed by Pandora's expert Dr. Stephan McBride, in which the airplay of selected songs was artificially reduced for some listeners. Dr. McBride's study concluded that "on average for new music from major labels, a spin on Pandora increases music sales revenue by a statistically significant +0.16 cents," with smaller (but still positive) effects for catalog or non-major label songs.<sup>24</sup> Since the results presented above for non-interactive services (finding a +0.11 cents effect across all songs) are not far from those of Dr. McBride, this provides support for the conclusion that the results with respect to interactive services, which indicate a much smaller and statistically insignificant promotion effect, are also likely to be informative.

29. As noted above, the estimated promotion effect of interactive services cannot be statistically distinguished from zero at the 5 percent level; however, the point estimates from the regressions indicate small positive promotion effects. In Exhibit G, I assume that those point estimates are correct (even though they are not statistically distinguishable from zero) and translate the estimated percentage effects into dollars per performance, as in Exhibit F. For interactive services, I am not aware of available data on the typical number of performances per hour listeners hear, and for that reason, Exhibit G assumes the same [REDACTED] performances per hour figure estimated above for Pandora. The results indicate, among all interactive listeners, a

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24. Written Direct Testimony of Stephan McBride, October 7, 2014, at ¶47 and Table 5.

net promotion effect per performance of less than \$0.0001 (actually, \$0.00003). The estimated \$0.0011 net promotion effect for non-interactive services from Exhibit F discussed above is more than 35 times higher than this net promotion effect for interactive services.

30. Neither this study nor Dr. McBride's study attempts to measure the promotion effect of webcasting on physical sales, which may be important, since as noted above, physical sales are still a substantial share of all music sales. Moreover, as also noted above, my study may miss some digital purchases made using other machines or at sites other than the iTunes Store or Amazon.com. As one approach to accounting for these missing promotion effects, I also considered the same set of calculations described above, but focused on only those individuals who purchased music during the sample period – *i.e.*, individuals who likely purchased a larger share of their music at the iTunes Store or on Amazon, using the machines observed in the data. In other words, I focused the analysis on a subset of individuals for whom the data are more likely to track a larger share of their purchases.

31. While this approach may help control for unobservable digital or physical purchases, it may also bias the results upward by focusing only on those individuals who purchase more music. For this reason, it is unclear whether these estimates, which are reported in the bottom panels of Exhibits F and G, or those discussed previously in the top panels, are more relevant. The bottom panel of Exhibit F calculates a net promotion effect of non-interactive webcasting of \$0.0066 per performance. That this calculated effect is much larger than the \$0.0011 effect calculated when including all non-interactive listeners indicates that the \$0.0011 figure may be quite conservative.

32. Exhibits F and G also report separate calculations excluding iTunes Radio, Amazon, and Google listeners, for the reasons discussed previously. The estimated effects are

smaller, but still material. Even excluding these services, the analysis indicates a net promotion effect of non-interactive listenership of \$0.0005 per performance when examining all non-interactive listeners, or \$0.0027 per performance when focusing on non-interactive listeners who purchased music during the sample period. The equivalent promotion effects for interactive services in Exhibit G are again much smaller. In all four specifications considered in Exhibits F and G, the estimated promotion effect for non-interactive services is at least 15 times higher than that for interactive services.

33. From an economic perspective, a net promotion effect on music sales is conceptually equivalent to a reduction in the marginal cost record labels incur in providing performances to streaming music services. In the case of both a net promotion effect and a reduction in marginal cost, the profit the record label generates from an incremental performance is increased. Therefore, the results in Exhibits F and G indicate that non-interactive services in essence impose lower marginal costs on copyright holders than do interactive services, and therefore, generate greater profits, all else equal. In order to quantify how a differential promotion effect would impact the royalty rates that willing buyers and willing sellers would negotiate for interactive and non-interactive services, it is necessary to make assumptions regarding the profit margin received by digital music sellers, and regarding what economists call a “pass-through rate,” *i.e.*, how much of a change in marginal cost is passed through in market prices buyers pay. I assumed that services selling digital music downloads take a 30 percent margin on sales.

34. With respect to pass-through rates, under a linear demand structure (which is the structure assumed by SoundExchange’s economic expert in prior proceedings) a monopolistic record label would have a 50 percent pass-through rate, while a perfectly competitive record




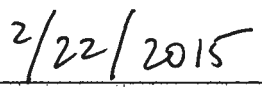
label would have a 100 percent pass-through rate.<sup>25</sup> Under non-linear demand structures, pass-through rates can be higher or lower than with linear demand, although empirical studies find higher pass-through under conditions of competition than under less competitive market conditions.<sup>26</sup> Broad empirical studies across many industries frequently find high pass-through rates, often approaching 100 percent.<sup>27</sup> Moreover, the pass-through rate for an entire industry (as is relevant here) is generally higher than pass-through rates for specific firms in the industry.<sup>28</sup>

35. For the purposes of this calculation, I considered a range of pass-through rates between 50 percent and 100 percent. Under these assumptions, a difference in net promotion effect of \$0.0011 would, all else equal, reduce the market royalty rate by between \$0.0004 and \$0.0008 per performance. *See* Exhibit H, which also reports similar calculations for the other specifications considered above. In all cases, the market royalty rate for non-interactive services would be reduced due to promotion, relative to the royalty rate for interactive services.

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25. Copyright Royalty Board, In the Matter of Digital Performance Right in Sound Recordings and Ephemeral Recordings, Docket No. 2005-1 CRB DTRA, “Testimony of Michael Pelcovits,” at 32. Dr. Pelcovits assumed a 50 percent pass-through rate. *Id.* The results regarding pass-through rates under monopoly and competition are derived in Jeremy I. Bulow and Paul Pfleiderer (1983) “A Note on the Effect of Cost Changes on Prices,” *Journal of Political Economy* 91(1):182-5, at 183.
26. Donghum Kim and Ronald W. Cotterill (2008) “Cost Pass-Through in Differentiated Product Markets: The Case of U.S. Processed Cheese,” *Journal of Industrial Economics* LV(1):32-48, at 32 (“We find that, under collusion, the pass-through rates for all brands fall between 21% and 31% while, under Nash-Bertrand price competition, the range of pass-through rates is between 73% and 103%.”)
27. *See, e.g.*, David Besanko, Jean-Pierre Dube, and Sachin Gupta (2005) “Own-Brand and Cross-Brand Retail Pass-Through,” *Marketing Science* 24(1):123-37, at 123 & 125 (“Own-brand pass-through rates are, on average, more than 60% for 9 of 11 categories ... As many as 14% of the own brand pass-through rates are significantly greater than one, implying that in these cases, on average the retailer offers a larger discount to the consumer than the retailer receives from the manufacturer”); *See also* James M. Poterba (1996) “Retail Price Reactions to Changes in State and Local Sales Taxes,” *National Tax Journal* 49(2):165-76, at 167 (“The results for the postwar period never reject the view that prices react one-for-one to tax changes”).
28. *See* the literature summary in RBB Economics (2014) “Cost Pass-Through: Theory, Measurement, and Potential Policy Implications,” Office of Fair Trading, at 154 (“The available empirical evidence supports the prediction that the price response to firm-specific cost shocks is lower than industry-wide cost shock.”)

I declare under penalty of perjury that the foregoing is true and correct.

  
\_\_\_\_\_  
Todd D. Kendall

  
\_\_\_\_\_  
Date

**Exhibit A**  
**Music Services Tracked in [REDACTED] Data**

<b>Music Service</b>	<b>Percent of Machines Accessing the Service<sup>(1)</sup></b>
<b>Interactive Services</b>	
Spotify	16.77%
SoundCloud	15.40%
MySpace	5.38%
Vevo	1.29%
Google	1.08%
Rhapsody	0.98%
Slacker	0.59%
Rdio	0.32%
Beats Music	0.23%
Other Interactive Services <sup>(2)</sup>	0.05%
<b>Non-Interactive Services</b>	
Pandora	21.04%
iTunes	4.72%
iHeartRadio	3.28%
TuneIn	1.70%
8tracks	1.22%
Jango	0.61%
Songza	0.30%
Live365	0.24%
Other Non-Interactive Services <sup>(2)</sup>	0.01%

(1) Access via website or desktop application. Share reflects number of machines that accessed the specified service at least once for more than 90 seconds during the six-month period March 2014 - August 2014.

(2) Other services include Amazon, BigPondMusic, Last.FM, and Rara (interactive); and MixRadio (non-interactive).

**Exhibit B**  
**Music-Interest Sites Tracked in [REDACTED] Data**

Website	Percent of Machines Visiting the Website At Least Once <sup>(1)</sup>
azlyrics.com	25.56%
billboard.com	10.43%
rollingstone.com	7.78%
livenation.com	6.83%
songlyrics.com	4.89%
allmusic.com	4.65%
songkick.com	3.91%
popcrush.com	2.75%
pitchfork.com	2.49%
lyrics.com	2.00%
stereogum.com	1.85%
allhiphop.com	1.60%
spin.com	1.53%
cmt.com	1.39%
consequenceofsound.net	1.28%
2dopeboyz.com	0.63%
hypetrak.com	0.47%
youredm.com	0.44%
theboot.com	0.41%
hypem.com	0.33%
factmag.com	0.33%
officialcharts.com	0.32%
digitalmusicnews.com	0.26%
dancingastronaut.com	0.24%
rapradar.com	0.22%
top40-charts.com	0.20%
edmsauce.com	0.20%
fakeshoredrive.com	0.16%
drownedinsound.com	0.16%
tinymixtapes.com	0.15%
residentadvisor.net	0.15%
countryweekly.com	0.15%
mojo4music.com	0.14%
indieshuffle.com	0.11%
thelineofbestfit.com	0.09%
lyricsworld.com	0.07%
popjustice.com	0.06%
thewildhoneypie.com	0.04%
daytrotter.com	0.03%

(1) Share reflects number of machines that accessed the specified service at least once during the six-month period March 2014 - August 2014.

**Exhibit C**  
**Summary Statistics for Variables Used in Analysis**

Variable	Entire Sample <sup>(1)</sup>		Among Non-Interactive Listeners <sup>(1)</sup>		Among Interactive Listeners <sup>(1)</sup>	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Monthly total listening time (in minutes)	117.64	706.20				
Monthly non-interactive listening time (in minutes)	4.39	56.69	37.09	161.15		
Monthly interactive listening time (in minutes)	113.22	704.06			678.59	1608.56
Monthly YouTube watching (in minutes)	662.05	1216.04	740.25	1211.74	821.77	1389.59
Monthly time spent visiting music-interest website (in minute	3.14	31.13	5.63	31.74	8.83	60.05
Monthly purchases of music	\$1.26	\$13.14	\$1.55	\$11.64	\$1.89	\$12.89
Monthly number of songs purchased	0.98	10.12	1.21	9.04	1.47	10.00
Observations	60,000		7,095		10,011	

(1) Listeners and listening time are defined as those observations that indicate listening of more than 90 seconds in a given month to the specified type of service.

**Exhibit D**  
**Estimated Relationship between Streaming Music Listening and Music Purchases**  
**(Standard Errors in Parentheses<sup>(1)</sup>, \* Indicates Statistical Significance at 5% Level)**

Dependent Variable:	Ln(Dollars)	Ln(Songs)	Ln(Dollars)	Ln(Songs)
	[1]	[2]	[3]	[4]
Ln(Total Listening Hours)	0.0046* (0.0013)	0.0043* (0.0012)		
Ln(Listening Hours - Interactive)			0.0027 (0.0015)	0.0024 (0.0014)
Ln(Listening Hours - Non-Interactive)			0.0070* (0.0017)	0.0066* (0.0016)
Ln(Hours on YouTube)	0.0024 (0.0016)	0.0021 (0.0014)	0.0023 (0.0016)	0.0020 (0.0014)
Ln(Hours on Music-Interest Websites)	0.0097* (0.0016)	0.0097* (0.0015)	0.0097* (0.0016)	0.0096* (0.0015)
Month 2 (April 2014)	0.0019 (0.0071)	0.0022 (0.0066)	0.0021 (0.0071)	0.0023 (0.0066)
Month 3 (May 2014)	-0.0053 (0.0071)	-0.0039 (0.0066)	-0.0048 (0.0071)	-0.0034 (0.0066)
Month 4 (June 2014)	-0.0025 (0.0072)	-0.0013 (0.0067)	-0.0019 (0.0072)	-0.0007 (0.0067)
Month 5 (July 2014)	-0.0052 (0.0073)	-0.003 (0.0068)	-0.0045 (0.0073)	-0.0024 (0.0068)
Month 6 (August 2014)	-0.0181* (0.0071)	-0.0147* (0.0066)	-0.0173* (0.0071)	-0.0139* (0.0066)
Machine Fixed Effects	Included	Included	Included	Included
Adjusted R-squared <sup>(2)</sup>	0.36	0.36	0.36	0.36
Number of Observations	60,000	60,000	60,000	60,000

Notes:

(1) Standard errors in parentheses clustered at the machine level.

(2) Computed using Stata's *areg* accounting for machine fixed effects.

**Exhibit E**  
**Estimated Relationship between Streaming Music Listening and Music Purchases**  
**Excluding iTunes Radio, Amazon Prime Music, and Google Play**  
**(Standard Errors in Parentheses<sup>(1)</sup>, \* Indicates Statistical Significance at 5% Level)**

Dependent Variable:	Ln(Dollars)	Ln(Songs)	Ln(Dollars)	Ln(Songs)
	[1]	[2]	[3]	[4]
Ln(Total Listening Hours)	0.0029*	0.0028*		
	(0.0013)	(0.0012)		
Ln(Listening Hours - Interactive)			0.0027	0.0024
			(0.0015)	(0.0014)
Ln(Listening Hours - Non-Interactive)			0.0034*	0.0032*
			(0.0017)	(0.0016)
Ln(Hours on YouTube)	0.0026	0.0022	0.0025	0.0022
	(0.0016)	(0.0014)	(0.0016)	(0.0014)
Ln(Hours on Music-Interest Websites)	0.0099*	0.0098*	0.0098*	0.0098*
	(0.0016)	(0.0015)	(0.0016)	(0.0015)
Month 2 (April 2014)	0.0018	0.0021	0.0018	0.0021
	(0.0071)	(0.0066)	(0.0071)	(0.0066)
Month 3 (May 2014)	-0.0055	-0.004	-0.0054	-0.0039
	(0.0071)	(0.0066)	(0.0071)	(0.0066)
Month 4 (June 2014)	-0.0027	-0.0015	-0.0026	-0.0013
	(0.0072)	(0.0067)	(0.0072)	(0.0067)
Month 5 (July 2014)	-0.0054	-0.0032	-0.0052	-0.003
	(0.0073)	(0.0068)	(0.0073)	(0.0068)
Month 6 (August 2014)	-0.0183*	-0.0149*	-0.0181*	-0.0147*
	(0.0071)	(0.0066)	(0.0071)	(0.0066)
Machine Fixed Effects	Included	Included	Included	Included
Adjusted R-squared <sup>(2)</sup>	0.36	0.36	0.36	0.36
Number of Observations	60,000	60,000	60,000	60,000

Notes:

(1) Standard errors in parentheses clustered at the machine level.

(2) Computed using Stata's *areg* accounting for machine fixed effects.

**Exhibit F**  
**Estimates of Per Performance Effect of Non-Interactive Webcasting on Music Sales**

		Include iTunes, Amazon, and Google	Excluding iTunes, Amazon, and Google
<b>Among Listeners to Non-Interactive Services</b>			
Mean Monthly Time Listening to Non-Interactive Services (Hours)	[1]	0.62	0.65
10% Increase in Time Listening to Non-Interactive Services (Hours)	[2] = [1] x 10%	0.06	0.07
Assumed Performances per Hour on Non-Interactive Services <sup>(1)</sup>	[3]	[REDACTED]	[REDACTED]
10% Increase in Time Listening to Non-Interactive Services (Performances)	[4] = [2] x [3]	[REDACTED]	[REDACTED]
Regression Coefficient on Ln(Non-Interactive Music Listening)	[5] = From Exhibit D/E	0.007	0.0034
Percentage Increase in Music Spending from 10% Increase in Non-Interactive Listening	[6] = [5] x 10%	0.0007	0.00034
Mean Monthly Music Spending among Listeners to Non-Interactive Services	[7]	\$1.55	\$1.36
Additional Music Spending from 10% Increase in Non-Interactive Listening	[8] = [6] x [7]	\$0.0011	\$0.0005
Additional Music Spending per Non-Interactive Performance	[9] = [8] / [4]	[REDACTED]	[REDACTED]
<b>Among Listeners to Non-Interactive Services who Purchased Music</b>			
Mean Monthly Time Listening to Non-Interactive Services (Hours)	[1]	0.55	0.60
10% Increase in Time Listening to Non-Interactive Services (Hours)	[2] = [1] x 10%	0.06	0.06
Assumed Performances per Hour on Non-Interactive Services <sup>(1)</sup>	[3]	[REDACTED]	[REDACTED]
10% Increase in Time Listening to Non-Interactive Services (Performances)	[4] = [2] x [3]	[REDACTED]	[REDACTED]
Regression Coefficient on Ln(Non-Interactive Music Listening)	[5] = From Exhibit D/E	0.007	0.0034
Percentage Increase in Music Spending from 10% Increase in Non-Interactive Listening	[6] = [5] x 10%	0.0007	0.00034
Mean Monthly Music Spending among Listeners to Non-Interactive Services	[7]	\$8.01	\$7.43
Additional Music Spending from 10% Increase in Non-Interactive Listening	[8] = [6] x [7]	\$0.0056	\$0.0025
Additional Music Spending per Non-Interactive Performance	[9] = [8] / [4]	[REDACTED]	[REDACTED]

(1) Based on 2014 Pandora performances per hour. Shapiro WDT, at p. D-3.



**Exhibit G**  
**Estimates of Per Performance Effect of Interactive Webcasting on Music Sales**

		Include iTunes, Amazon, and Google	Excluding iTunes, Amazon, and Google
<b>Among Listeners to Interactive Services</b>			
Mean Monthly Time Listening to Interactive Services (Hours)	[1]	11.31	11.41
10% Increase in Time Listening to Interactive Services (Hours)	[2] = [1] x 10%	1.13	1.14
Assumed Songs per Hour on Interactive Services <sup>(1)</sup>	[3]	[■]	[■]
10% Increase in Time Listening to Interactive Services (Performances)	[4] = [2] x [3]	[[■]]	[[■]]
Regression Coefficient on Ln(Interactive Music Listening)	[5] = From Exhibit D/E	0.0027	0.0027
Percentage Increase in Music Spending from 10% Increase in Interactive Listening	[6] = [5] x 10%	0.00027	0.00027
Mean Monthly Music Spending among Listeners to Interactive Services	[7]	\$1.89	\$1.90
Additional Music Spending from 10% Increase in Interactive Listening	[8] = [6] x [7]	\$0.0005	\$0.0005
Additional Music Spending per Interactive Performance	[9] = [8] / [4]	[[■]]	[[■]]
<b>Among Listeners to Interactive Services who Purchased Music</b>			
Mean Monthly Time Listening to Interactive Services (Hours)	[1]	11.11	11.16
10% Increase in Time Listening to Interactive Services (Hours)	[2] = [1] x 10%	1.11	1.12
Assumed Songs per Hour on Interactive Services <sup>(1)</sup>	[3]	[■]	[■]
10% Increase in Time Listening to Interactive Services (Performances)	[4] = [2] x [3]	[[■]]	[[■]]
Regression Coefficient on Ln(Interactive Music Listening)	[5] = From Exhibit D/E	0.0027	0.0027
Percentage Increase in Music Spending from 10% Increase in Interactive Listening	[6] = [5] x 10%	0.00027	0.00027
Mean Monthly Music Spending among Listeners to Interactive Services	[7]	\$7.79	\$7.79
Additional Music Spending from 10% Increase in Interactive Listening	[8] = [6] x [7]	\$0.0021	\$0.0021
Additional Music Spending per Interactive Performance	[9] = [8] / [4]	[[■]]	[[■]]

(1) Assumed to be equal to performances per hour on Pandora. See notes to Exhibit F.

## Exhibit H

## Estimated Difference in Interactive and Non-Interactive Royalty Rates Due to Differences in Net Promotional Effects

		Among Listeners to Specified Services		Among Listeners to Specified Services who Purchased Music	
		Include iTunes, Amazon, and Google	Excluding iTunes, Amazon, and Google	Include iTunes, Amazon, and Google	Excluding iTunes, Amazon, and Google
Additional Music Spending per Non-Interactive Performance	[1] = From Exhibit F	[[REDACTED]]	[[REDACTED]]	[[REDACTED]]	[[REDACTED]]
Additional Music Spending per Interactive Performance	[2] = From Exhibit G	[[REDACTED]]	[[REDACTED]]	[[REDACTED]]	[[REDACTED]]
Difference in Music Spending per Performance	[3] = [1] - [2]	\$0.00112	\$0.00044	\$0.00651	\$0.00261
Assumed Retailer Margin	[4]	30%	30%	30%	30%
Difference in Interactive and Non-Interactive Marginal Cost	[5] = [3] x (100% - [4])	\$0.00078	\$0.00030	\$0.00456	\$0.00182
Low Pass-Through Rate	[6]	50%	50%	50%	50%
Low Difference in Interactive and Non-Interactive Royalty Rates	[7] = [5] x [6]	\$0.0004	\$0.0002	\$0.0023	\$0.0009
High Pass-Through Rate	[8]	100%	100%	100%	100%
High Difference in Interactive and Non-Interactive Royalty Rates	[9] = [5] x [8]	\$0.0008	\$0.0003	\$0.0046	\$0.0018

**TODD D. KENDALL**  
Senior Vice President

**February 2015**

Business Address: Compass Lexecon  
332 S. Michigan Ave.  
Chicago, IL 60604-4937

(312) 322-0250  
tkendall@compasslexecon.com

**EDUCATION**

University of Chicago, Chicago, Illinois  
Ph.D. (Economics), 2003  
Concentrations: mathematical economics, labor economics

University of Chicago, Chicago, Illinois  
M.A. (Economics), 2000

University of Chicago, Chicago, Illinois  
B.S. (Mathematics), 1998

**PROFESSIONAL EXPERIENCE**

Compass Lexecon, Chicago, Illinois  
Senior Vice President (2014 – Present)  
Vice President (2012 – 2014)  
Senior Economist (2009 – 2012)  
Economist (2008 – 2009)

Clemson University, Clemson, South Carolina  
Assistant Professor of Economics (2003 – 2008)

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**HONORS, GRANTS, AND FELLOWSHIPS**

Honorary Lecturer, Wofford College (2007)

Honorable Mention, Economic Communicators Contest (Assn. of Private Enterprise Educ.) (2007)

College of Business and Behavioral Science Faculty Seed Grant, Clemson University (2006)

University Research Grant, Clemson University (2005)

John M. Olin Prize (for excellence in dissertation work), University of Chicago (2001)

Lynde and Harry Bradley Foundation Fellowship (1998-2001)

Century Scholarship (1998-2001)

Sigma Xi (1998)

**APPENDIX B: MATERIALS RELIED UPON**

**Copyright Royalty Board Documents**

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